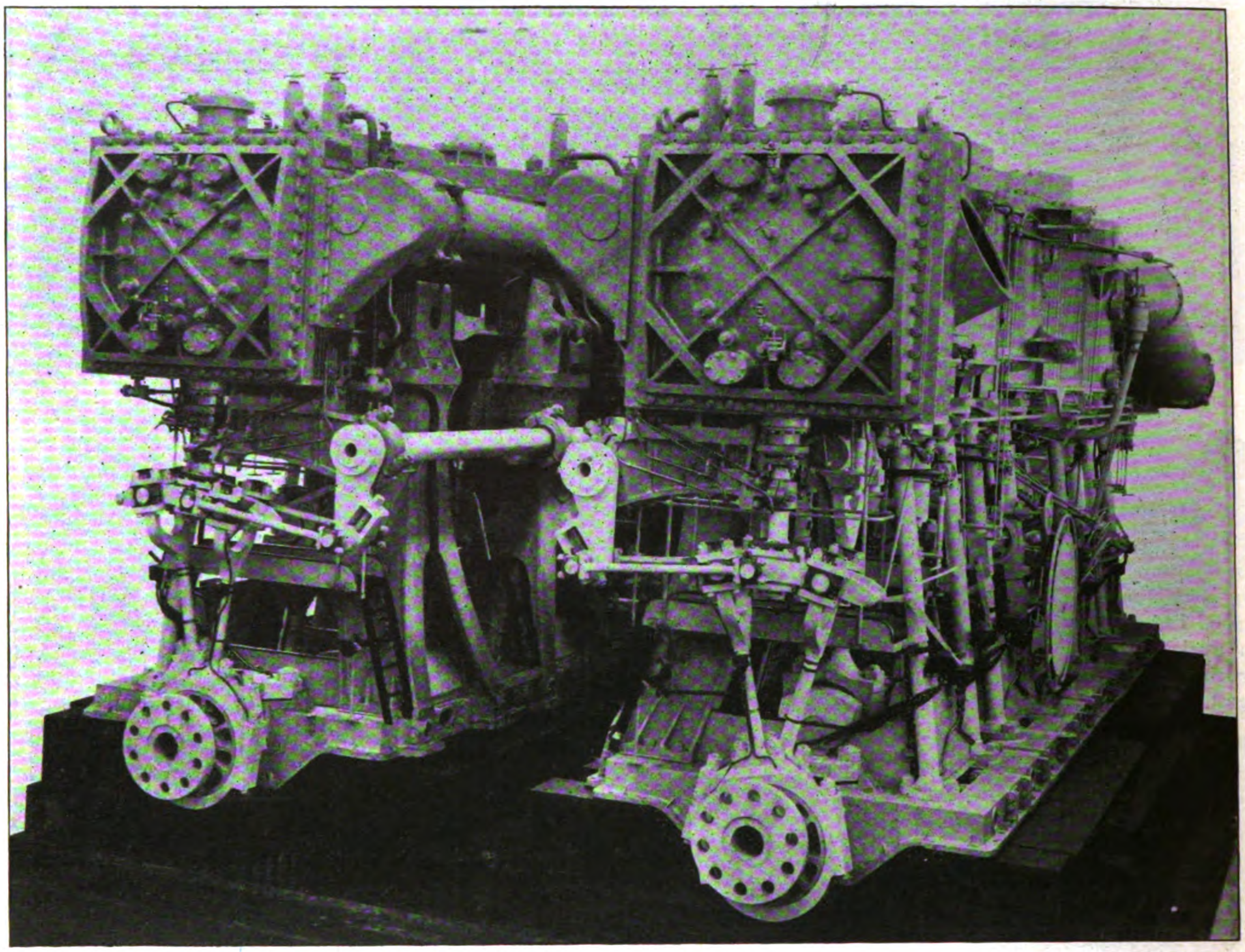
THE MARINE REVIEW

VOL. XXXIV. CLEVELAND, OCTOBER 4, 1906. No. 14.

NEW BRITISH CRUISER NATAL.

The armored cruiser Natal, the latest of many warships built for the British navy by Messrs. Vickers, Sons & Maxim, Ltd., at their naval construction works at Barrow-in-Furniss, went through her trials in the early part of August, including a series of searching tests to determine her speed, radius of action, and maneuvering capabilities. These tests, which are specified by the admiralty, require that the propelling machinery of all ships shall be run for thirty hours at one-fifth the full power, for a second thirty hours at 70 per cent of the full power, and for eight hours at the maximum power, and during these respective tests no change can be made in the machinery, nor must any water be used on the bearings, while all the doors connecting the various machinery compartments must be closed, as in war service. The Natal was loaded to her full draught of 27 feet, at which she has a displacement of 13,550 tons, and she maintained a speed throughout the thirty hours of 21.35 knots. The eight hours' full speed trials resulted highly satisfactorily. The engines were run at 137 revolutions per minute, and her I. H. P. was 23,592, as compared with the anticipations in design, which was 23,500 I. H. P. The mean speed of several runs over the measured mile was 23.344 knots, compared with her designed speed of 22.33 knots, the result being more than a nautical mile above her guarantee. One of the features of the Natal is that she is fitted up for the consumption of oil fuel as well as coal, a new departure in recent war vessels which has enormously increased the distance which a modern ship can travel, especially at a continuous sea speed, without requiring to recoal. When the bunkers near the boilers are empty, oil fuel can be burned, liberating the stokers for other work on deck if necessary, or giving them the leisure to remove coal from the other bunkers farther from the point of con-

NEW BRITISH CRUISER NATAL.

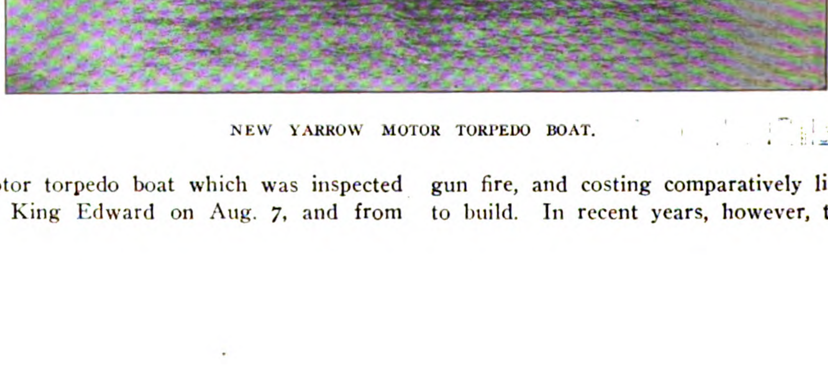


ENGINES OF BRITISH CRUISER NATAL.

sumption. This is said to be an enormous advantage from a tactical point of view. The consumption of coal on the Natal gave very satisfactory results. With all her auxiliary machinery at work the coal consumption was 1.8 lb. per I. H. P. per hour, and it is calculated that with oil fuel the consumption will be about 1 lb. of oil per I. H. P. per hour. The Natal has thus the power of steaming at 21½ knots speed a distance well over 4,000 nautical miles. There is bunker capacity for carrying 2,000 tons of coal, in addition to the storage of a large quantity of oil fuel in the double bottom. In this new cruiser the 6-inch gun has been discarded, and she carries six 9.2-inch weapons and four 7.5-inch quick-firers, and can fire projectiles of 380 pounds and 200 pounds, respectively. The muzzle energy of these guns has been greatly increased. All the guns are mounted in barbettes protected with 6-inch armor, and the whole of the broadside amidships is clad with 6-inch plating, reduced to 4-inch at the ram and 3-inch at the stern. There is an athwartship bulkhead to stop raking fire. It can thus be judged she is very effectively armored. Torpedo guns (ten in number) are placed in a very advantageous position underneath her very high navigating bridge. There are also twelve of these guns aft.

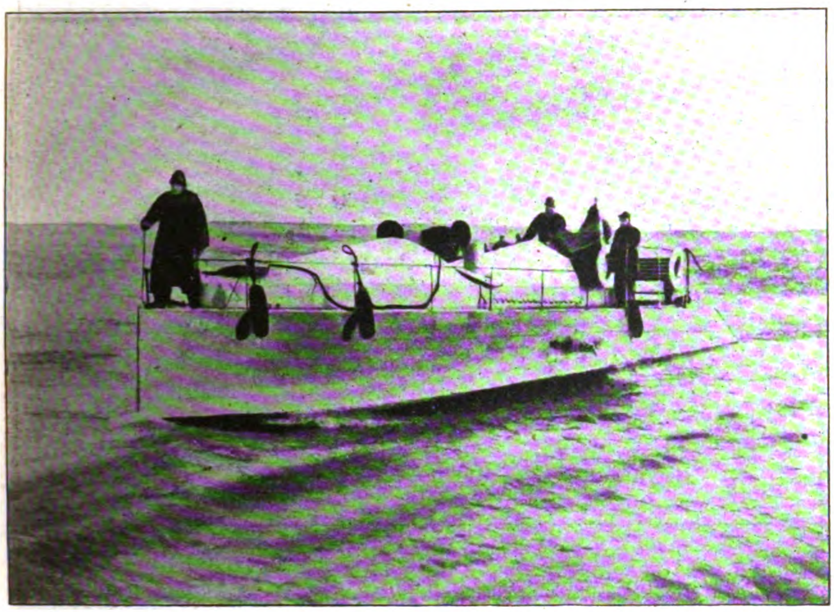
YARROW MOTOR TORPEDO BOATS.

Messrs. Yarrow & Co., ship builders, of Poplar, London, have favored us with the accompanying illustration of their motor torpedo boat which was inspected by King Edward on Aug. 7, and from which great things are expected. This little craft is propelled by internal combustion engines, and is a new departure in the system of naval defense adopted for the protection of estuaries or harbors. One authority says that the original idea of the torpedo boat flotillas was that they should consist of a great number of small units, each possessing high speed, exposing a small area to gun fire, and costing comparatively little to build. In recent years, however, two



NEW YARROW MOTOR TORPEDO BOAT.

of these essential principles have been departed from, and increased speed has been the object, necessitating larger boats, until the length of these craft, beginning at ~~75 ft.~~ has gradually increased to over 150 ft. As the cost of each vessel has also been proportionately greater, it has followed that fewer boats have been built. It is doubtful whether this policy of fewer boats but larger craft has been the wiser, and whether the money might not have been better spent by



COMPARISON BETWEEN TORPEDO BOATS WITH INTERNAL COMBUSTION ENGINES, AND TORPEDO BOATS WITH STEAM MACHINERY.

The speeds are given on the basis of both boats carrying a load of 3 tons. As in the Motor Torpedo Boat there is only 1 ton of fuel, as compared with 2 tons in the Steam-Driven Boat, the Motor Torpedo Boat would be capable of carrying 1 ton more armament than the Steam-Driven Boat.

WITH INTERNAL COMBUSTION ENGINE.	WITH STEAM MACHINERY.
Speed, 24 knots, carrying a load of 3 tons.	Speed, 18 knots, carrying a load of 3 tons.
Radius of action at full speed, 250 miles.	Radius of action at full speed, 108 miles.
Fuel capacity, 1 ton.	Fuel capacity, 2 tons.
Lifting weight for transport by rail, 8 tons.	Lifting weight for transport by rail, 12 tons.

a return to the former plan. Messrs. Yarrow's motor torpedo boat is 60 ft. long by 9 ft. beam, is provided with three propellers and has a speed when loaded with three tons (an ample allowance for weight of torpedoes and fuel) of 24 knots, whilst a torpedo boat driven by steam and carrying the same load would only attain to 18 knots. The radius of action of the former is 300 miles for one ton of fuel and that of the latter 60 miles. An important feature of the Yarrow motor boat is that the petrol is carried in a special tank, and the tank does not form any part of the structure of the hull, so that in case of damage none of the petrol could find its way into the interior of the boat, thus avoiding a source of possible danger. The armament of such a torpedo boat might be either one torpedo in a revolving tube, or two in dropping par at the side, and, moreover, she could carry one ton more armament than a steam driven boat of similar capacity owing to the smaller amount of fuel she requires.

This little vessel has been subjected to exhaustive trials, the success of which has induced the British admiralty to purchase her; and after delivery further experiments will be made in order that the value for defensive purposes of a flotilla of such boats may be determined. In considering this subject it should be observed that a craft of this size and weight—namely, eight tons—can be transported with facility by rail from one coast to another, so that a port undefended one day might be placed in a state of defense the next. In a run made on Aug. 7 from Cowes to Southhampton and back at 24 knots speed, the vibration was found to be exceptionally slight, although the engines were running over 1,000 revolutions a minute, their normal speed. It is suggested that the method of carrying out a system of defence with such craft would be to have special stations allotted to them apart from a dockyard in the proximity of the mouth of any river or harbor to be defended, and it may be interesting to remark that 350 of these little vessels could be provided for the price of one Dreadnought. It is said that the firm of Messrs. Yarrow & Co. is already directing its attention to the construction of larger and more habitable boats of the same kind, intended to keep the sea for longer periods. Mr. Yarrow, referring to the purchase of this boat by the British admiralty, said it was only one of the many instances showing how desirous the present board of admiralty was to avail themselves of any modern improvement to increase the efficiency of the British navy.

TURBINE STEAMER CREOLE.

The twin-screw turbine steamer Creole, recently launched from the yard of the Fore River Ship Building Co., Quincy, Mass., is a steel steamship of the hurricane deck type specially designed and constructed for the Atlantic Steamship line of the Southern Pacific Co. The vessel has a straight stem and semi-elliptical stern. The elevation shows one large smokestack and two short pole masts. A large superstructure has been constructed amidships on top of the hurricane deck, with the deck houses superimposed on same.

The following are the principal dimensions:

Length over all	440 ft. 0 in.
Length between perpendiculars	416 ft. 0 in.
Breadth molded	53 ft. 0 in.
Depth molded to upper deck	37 ft. 0 in.
Length of superstructure	182 ft. 0 in.

The Creole is intended as a first-class passenger and freight steamship and the hull has been specially designed to provide against the weakness inherent in hurricane deck vessels having large cargo ports in wake of the overall hatches on hurricane deck.

The vessel has five decks, and is subdivided by transverse water-tight bulkheads into four cargo holds, in addition to the various 'tween decks, which are pierced on the sides with large hinged cargo ports providing for the expeditious handling of cargo.

At the forward end of the steel superstructure a large dining saloon has been constructed, providing seating capacity for 164 first-class passengers. This saloon has a mahogany wainscoting and border and is finished in white, including the panels and ceiling. The upholstery, tapestry and hangings have a dark green color effect and the saloon is lighted around three sides by especially large hinged air ports. Adjoining this dining saloon there has been arranged a commodious serving pantry with the usual accessories and utensils commonly found in this department. The pantry is in close connection by spacious passages with the general galley. Conveniently arranged in their vicinity are the scullery, bakery, wine rooms, stewards' stores, etc., in addition to which cold storage has been provided at the forward end of the engine casing. On top of the superstructure the saloon deck extends for about 176 ft., on which is built a steel

house enclosing accommodations for first-class passengers and comprising 34 staterooms, with bath rooms, lavatories, etc., and a large library at the extreme forward end of the staterooms.

On the pronenade deck overhead additional staterooms are provided, 33 in number some of which are especially arranged en suite.

Two grand stairways provide access to saloon deck and ample provision is made for bath rooms, lavatories, etc., amidships on this house.

A comfortable smoking room has been constructed at the aft end of the promenade deck, fitted up in luxurious manner, with oak wainscoting and panels above, the whole having a green color effect in Old Dutch finish. The other rooms on this deck consist of the bar and barber shop, placed conveniently with the smoking room.

Altogether accommodation has been provided for 152 first-class passengers, principally in two-berth state rooms.

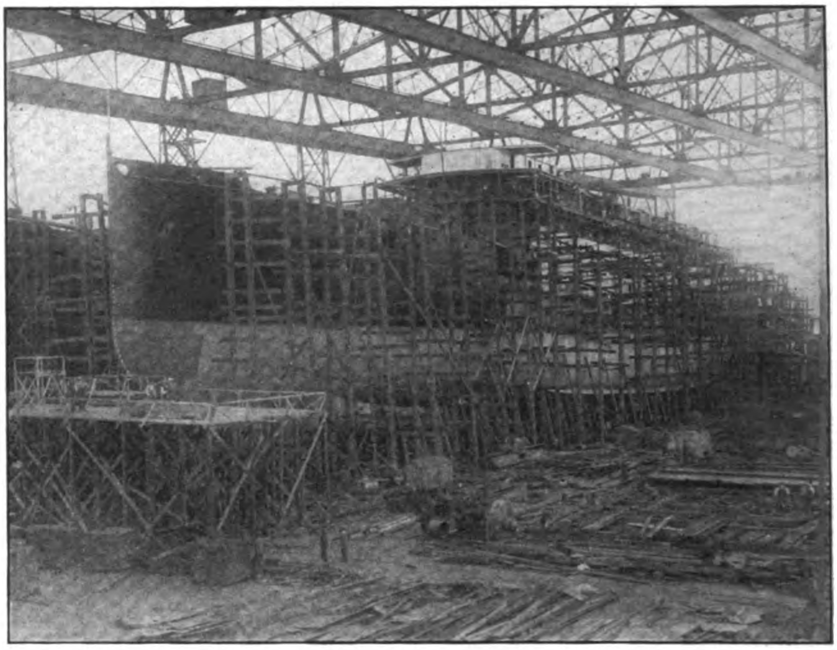
The second-class passengers, to the number of 58, have been provided for in staterooms in a large Liverpool house on the poop deck aft, and the main 'tween decks are arranged for the accommodation of 258 steerage passengers. The total ship's complement will equal the large total of 587 all told.

The principal interest centering in the S. S. Creole is the fact that a new departure has been made in the propelling machinery, which will consist in the installation of two 10-ft. reversing Curtis turbines, developing a combined capacity of 8,000 brake horsepower, which, it is estimated, will propel the vessel at a speed of about 18 knots per hour. These turbines are supplied with steam by ten Babcock & Wilcox water tube boilers.

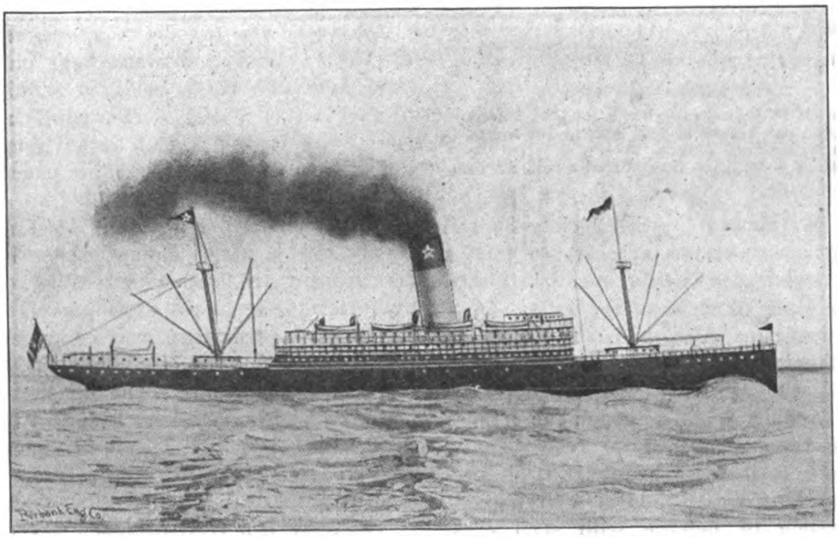
A number of minor machinery installations have been incorporated in this vessel, including a Linde refrigerating plant, a powerful electric light installation, a Brown patent telemotor steam steering gear, steam winches, steam windlass and capstans.

One of the most interesting systems fitted in this vessel is the fire extinguishing and disinfecting machine of the well known Clayton type. This apparatus consists of a generator which can be charged with sulphur and an air fan operated by steam with pipes leading to the holds, 'tween decks, bunkers, and all parts of the ship where freight or combustible freight is carried. In addition to this provision for guarding against fire, there is to be the usual fire extinguishing installation required by law.

Altogether the Creole in design, construction, equipment and appointments is probably one of the best and most complete vessels of her class afloat. The equipment and fittings are of the highest order and the materials and workmanship are of the best throughout.



TURBINE STEAMER CREOLE ON THE STOCKS.



THE CREOLE AS SHE WILL LOOK WHEN COMPLETED.

FINANCIAL STATEMENT NEW YORK DRY DOCK CO.

The New York Dry Dock Co. has issued its report for the fiscal year ended July 31 last, which shows a surplus of $762,810 after fixed charges, this being an increase of $256,413 as compared with the preceding year. There also was a big increase in both gross and net earnings.

The income account compares as follows:

	1906.	1905.	1904.
Gross	$2,130,980	$1,845,171	$1,670,446
Expenses and tax.	889,596	875,574	806,060
Net	$1,231,384	$969,597	$864,386
Charges ..	468,573	463,200	463,200
Surplus..	$762,811	$506,397	$401,186

The general balance sheet of the company, as of July 31, shows total assets of $31,347,864, as compared with $30,987,587 in the previous year. The cash in bank was $508,918, as against $403,921 in 1905; accounts receivable, $138,667, compared with $123,399; accounts payable, $15,529, as against $14,022; profit and loss surplus, $1,163,478, as compared with $925,711 at the close of the fiscal year 1905.

George J. Gould has purchased the English-built turbine yacht Lorena. This yacht was built in 1903 for Amzi L. Barber and is 300 ft. over all, 269 ft. keel, 33 ft. 5 in. beam, and 20 ft. deep.

HYDROGRAPHIC SURVEY STEAMER FOR CANADA.

The contract for the construction of a steamer for the Canadian Hydrographic Survey, Pacific coast, has lately been awarded to the British Columbia Marine Railway Co., of Esquimalt, B. C. She is to be completed and delivered ready for service on July 1, 1907. The designs for this vessel were approved by the Hon. Mr. Brodeur, minister of marine and fisheries on April 15, 1906, and public tenders were immediately invited. The plans etc., were prepared in the office of Mr. W. J. Stewart, hydrographer, in Ottawa, by Mr. R. L. Newman, of Victoria, B. C., and are for a twin-screw, schooner-rigged steamer, with smokestack amidships, 172 ft. long over all, 163 ft. between Lloyds perpendiculars, 27 ft. molded width, 15 ft. deep and drawing 11 ft. 3 in. On this draught she will carry 150 tons of coal and have a displacement of 780 tons.

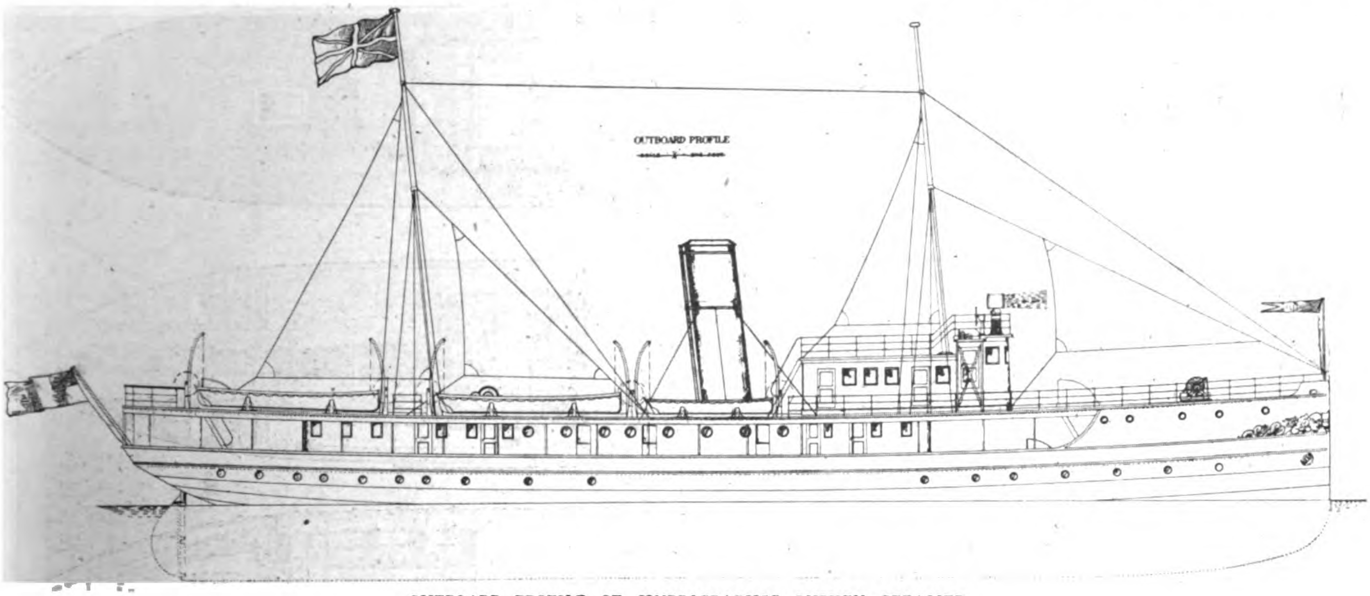
She will be of steel throughout, with a double bottom and seven water-tight compartments, bilge keels and large fresh water tanks. She is intended to be slightly stronger than Lloyds require, both in plating and frames.

She will have two decks, main and spar. The main deck forward will be sheltered by extending the bulwarks right up to the spar deck for a distance of 35 ft. Under this shelter will be bath and wash rooms for crew, refrigerator, vegetable locker, etc. On this deck will be a steel house 90 ft. long by 18½ ft. wide, leaving a passage on each side 4 ft. wide. In this house will be situated saloon and smoking room, with pantry and storeroom aft for surveying staff, large engine room, boiler room, galley, cabins for engineers and mate, and bath, pantry and saloon for ship's officers.

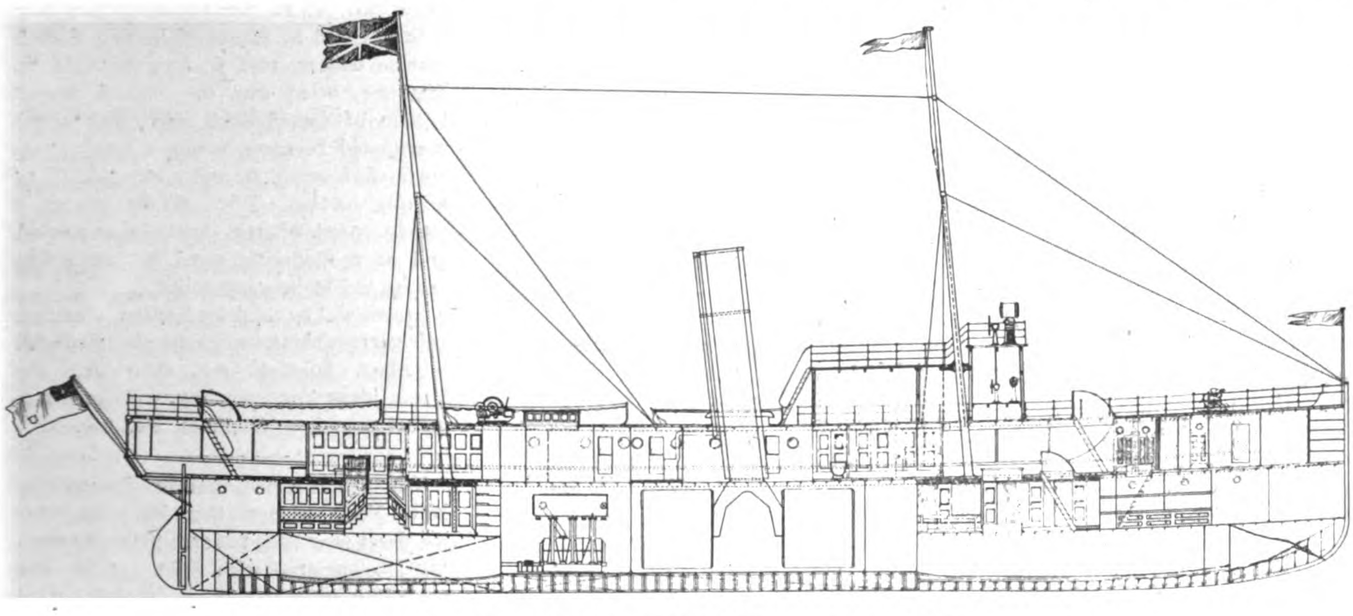
In a small house on the spar deck will be wheelhouse, cabin for sailing master and large airy chart room. Abaft the smokestack will be fitted six pairs Welvin patent davits for two launches, two gigs and two dories, with steam winch for hoisting them. This spar deck will be the full size of the main deck below.

Over the wheelhouse will be the bridge, extending from side to side and fitted in the usual way.

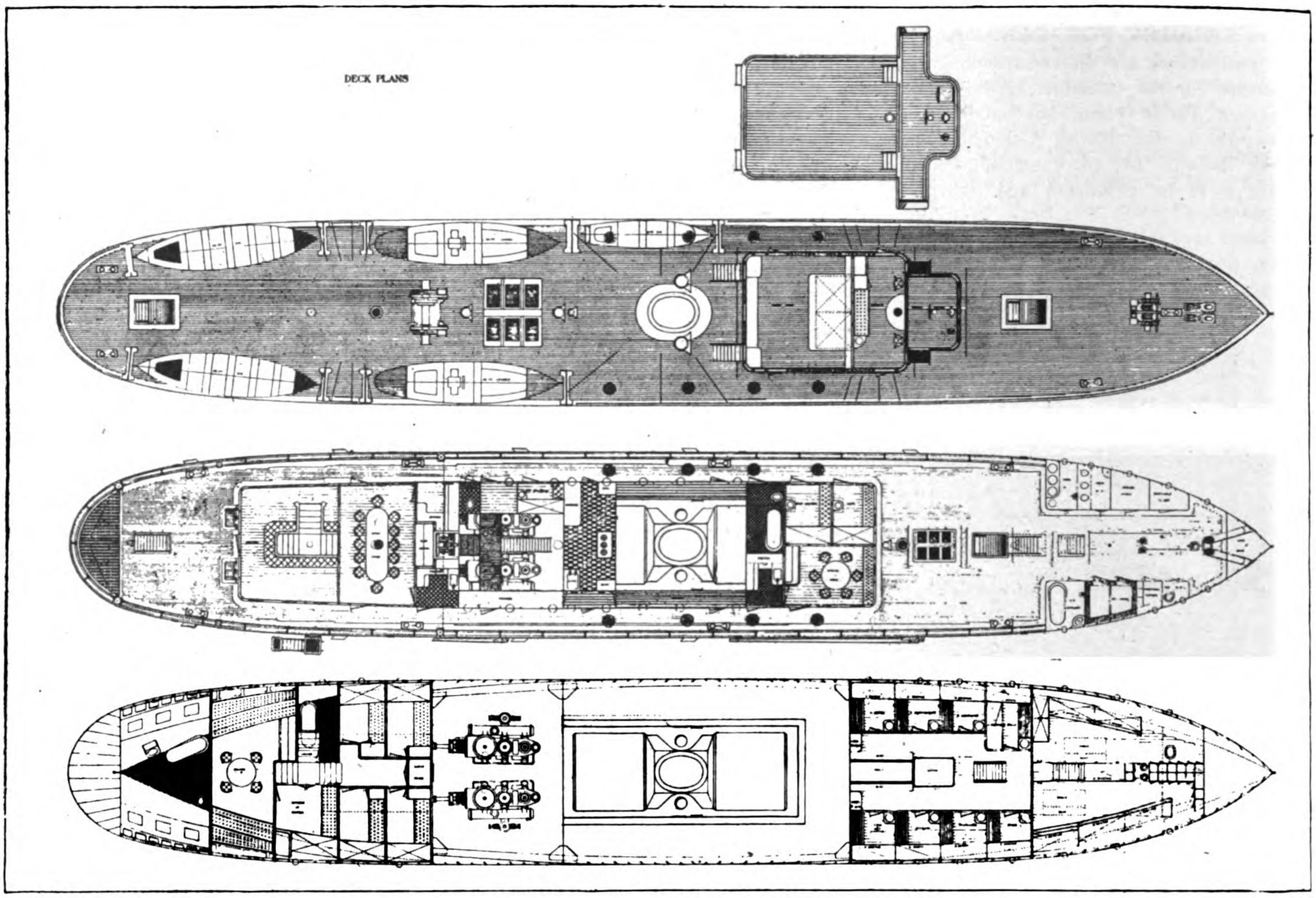
The main accommodation will be fitted below the main deck. The crew and firemen in separate quarters forward, petty officers in cabins between forecastle and coal bunkers, and the surveying staff abaft the engine room, four large cabins and bath room for assistants, and cabin, sitting room and bathroom for the officer in charge. She is expected



OUTBOARD PROFILE OF HYDROGRAPHIC SURVEY STEAMER.



INBOARD PROFILE OF HYDROGRAPHIC SURVEY STEAMER.



DECK PLAN OF HYDROGRAPHIC SURVEY STEAMER.

MIDSHIP SECTION OF HYDROGRAPHIC SURVEY STEAMER.

to carry five surveying officers, four ship's officers and thirty-three of a crew.

As mentioned above, she will be twin-screw, triple-expansion engines, 11½, 18 and 24 in., with a 24-in. stroke, driving two four-bladed propellers, 8 ft. in diameter, 120 revolutions, developing about 900 H. P.

Steam will be furnished by two Scotch marine boilers, 10¼ ft. long by 11½ ft. diameter, fitted with the Ellis & Eaves system of forced draft, each with three corrugated furnaces giving a total grate surface of 20 sq. ft. and 2,200 sq. ft. of heating surface. With 180 lbs. steam, a steady speed of 11½ knots is expected, and at a moderate speed her steaming radius would be 4,000 miles.

Steam will be used for heating, steering, refrigerator plant, turbine for electric light, windlass, hoisting, etc., etc.. All the latest ideas for sounding will be used, patent sounding machines, etc., etc.

The International Steam Pump Co., New York, reports that its profits for the fiscal year ended March 31 are $2,255,312 as compared with $1,617,435 for the preceding year.

The plant of the Neafie & Levy Ship & Engine Building Co. was offered for sale at public auction last week, but was withdrawn owing to the fact that there was no higher bid than $100,000. The United States court has fixed the minimum bid for the property at $300,000.

THE INTRODUCTION OF CRANES IN SHIP YARDS.

BY ALEXANDER MURRAY, ESQ.*

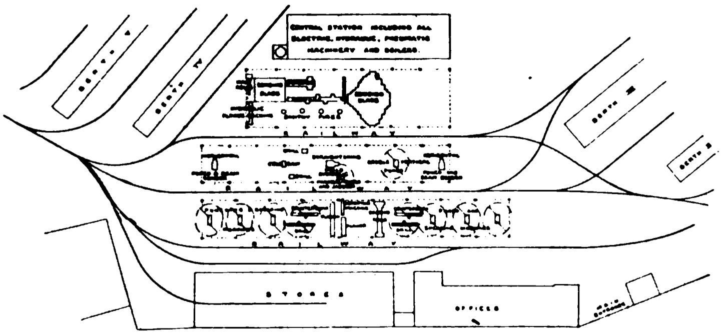
The last few years have seen many changes in ship yards. The general introduction of electricity as a motive power and the ever-increasing use of compressed air have greatly simplified operations and brought advantages which otherwise would have been extremely d'fficult to attain.

One of the most important improvements is the introduction of efficient crane services, both in the sheds and over the building berths. The keener competition grows, the greater the need of increased economy, and of more thorough utilization of all advantages obtainable from modern appliances. Good cranes working in connection with a well-disposed set of railway lines tend greatly to the reduction of one of the greatest sources of expense. The easier the transport is made, the more economically can large pieces be worked, resulting not only in a quicker turn out, but a decided improvement in the quality of the vessel built. Fitting up cranes and rearranging machinery mean heavy expenditure, but the money laid out for a really good facility soon brings its return in labor saved. Under the old conditions it was difficult for the men with their two-wheeled barrows to draw pieces weighing one ton through the sometimes soft ground, whereas now, half the number of men can easily bring plates of three tons and over to the machines and the ships. For instance, in a yard fitted out with machinery capable of dealing with plates up to 20 ft. in length, but without cranes or rail connection from the sheds to the berths, the cost of moving shell plates from one machine to another and to the ships was from 1s 2d to 1s 5d each, while in the same company's new yard, with fairly well-disposed cranes and railways, shell plates up to 32 ft. in length can be handled for 6d to 7d each, equal to a saving of about 75 per cent. This is the result of having the cranes and machines so placed that the heavy pieces can all be brought up to the places of working by mechanical means. The squads, receiving their materials delivered within easy reach of the cranes belonging directly to their own machine, incur a minimum loss of time, and are consequently better able to get the full amount of work out of the tools. The nature of the site and the position of the sheds relative to the berths, as well as climate and many other local circumstances, have a great influence upon the design of an arrangement for any yard. A disposition, however, which has a good prospect of proving successful must, as far as possible, reduce the expense of transport and all unnecessary handling of materials. Fig. 1 (Plate I) shows an arrangement adopted in an Italian yard, which has the advantage of being comparatively cheap, but which occupies considerable space. In this case the machines are disposed in long rows under open sheds, situated between two groups of berths. Between the rows of machines railway lines are laid, so that the locomotive cranes can reach almost to the center of each shed, and lift or lay down materials at each machine in the yard. The railway leads directly to the berths and stores, so that the whole transport is carried out by steam locomotive cranes and wagons, two men only being required for each squad, one driver on the crane and one to hook on materials and adjust the railway shunts. Turntables were carefully avoided in the laying of the rails, as they are a considerable source of expense both in upkeep and time during working. Another system is shown in Fig. 2, which is decidedly more suitable for our northern climate, where it is often desirable to have the shed closed at the sides. It is more expensive, but more compact; and, if anything, more efficient. Here the machines are arranged in a large shed with overhead traveling cranes running the whole length of the building, much in the manner adopted by engineers in their erecting shops. At various points the railway is led into the shed for the conveyance of materials. In the main shed the heavy machines are placed, while the sides are utilized for light work and laying-off purposes. In each of the high compartments three cranes are mounted. A long shed like this, however well equipped, has the disadvantage that it is often difficult to push work through quickly; because, if one crane happens to be detained longer than usual at one machine, the others, not being able to pass, are interrupted in their progress. Probably the most efficient management is, when the long shed is cut up into several short ones with the cranes running parallel to one another, as in Fig. 3.

Erecting cranes at the building berths are almost more necessary still, in order to handle heavy pieces economically and keep up with modern

FIG. I.

ARRANGEMENT OF PLATERS' SHEDS, MACHINES AND RAILWAY, IN THE CANTIERE NAVALI, PALERMO, (BUILT IN 1900.)



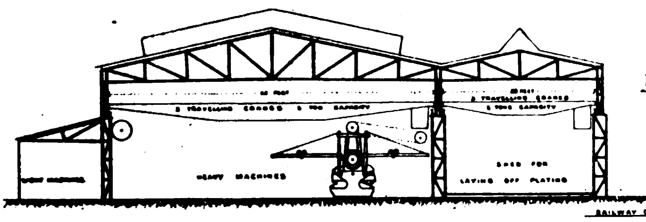
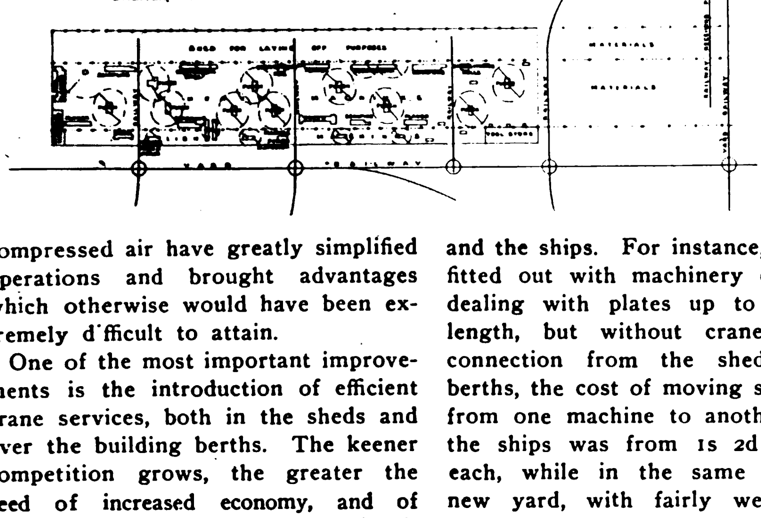


FIG. 2.

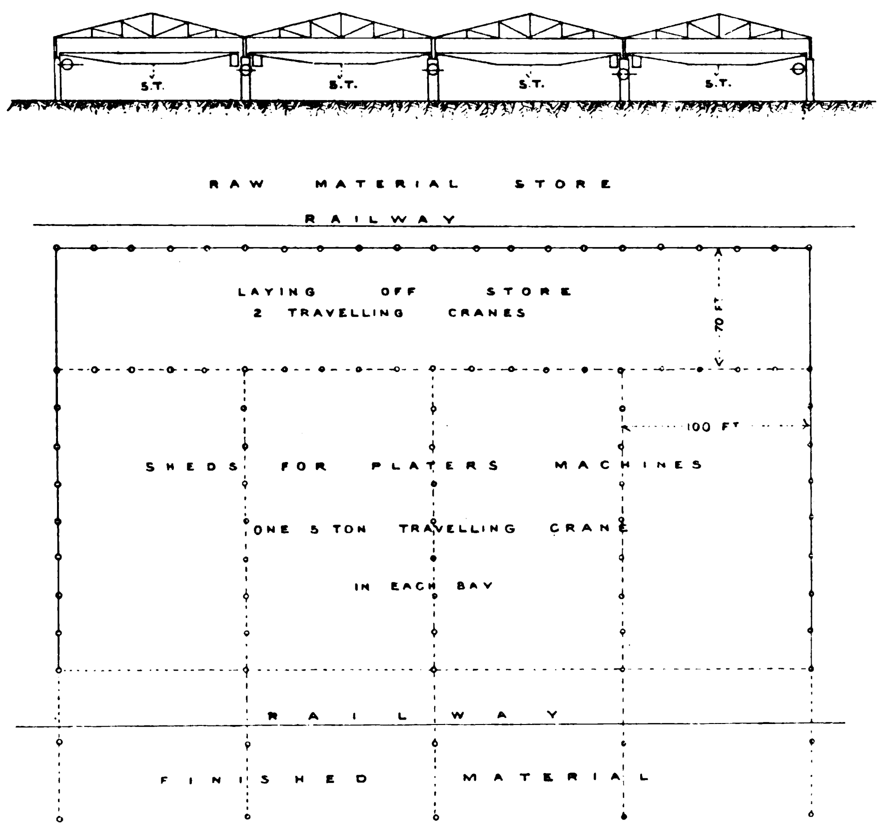
ARRANGEMENT OF PLATERS' SHED ETC., IN THE BREMER VULCAN YARD AT VEGESACK.



*Institution of Naval Architects.

FIG. 3.

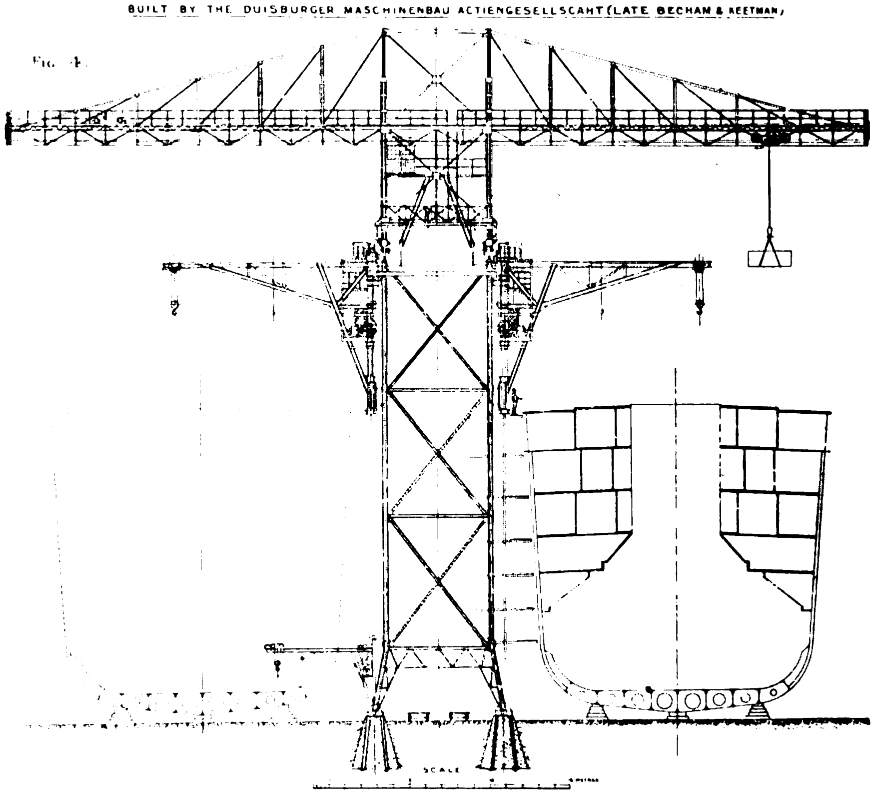
PROPOSED ARRANGEMENT OF PLATERS' SHEDS AND CRANES



competition. Each part of the vessel has to be raised and held in place for screwing up, and all time lost in rigging-up tackle or other appliances is a gain for the modern crane. A comparison of work executed in the two yards already referred to shows a very great advance in favor of the cranes. The erecting of double-bottom framing with masts and derricks costs about twice as much as with cranes; beams and side framing about one and three-quarters times; deck plating about two and a half times; outside plating about twice. Bulkheads are screwed together on the ground and lifted into place by the cranes in one or two pieces, at a cost of about one-third of the labor required to erect them bit by bit in the old yard. Certainly there are many operations where little or no saving is gained, so that the total is not quite so great an economy as might at first be expected. The comparison of labor expended on the building of the hull of two almost exactly similar cargo steamers of 6,000 tons dead weight showed a saving of fully nine per cent when the vessel was built under cranes. The first of the two vessels was built on a berth fitted with five masts and corresponding winches and derricks; the second on a berth served by two cantilever cranes. The size of the plates in each vessel were similar, so that this may be taken as a fair estimate of the saving attained directly from the use of the cranes. Another comparison of two cargo and passenger vessels of about 7,000 tons dead weight, one built under masts and derricks and with short plates, not exceeding 20 ft., and the other under cranes with plates up to 30 ft. in length, the saving worked out to 32 per cent, after making a liberal allowance for difference of dimensions and arrangements. In both cases the wages for joiners, painters, riveters, smiths, etc., which are little influenced by the cranes, are excluded, only the iron worker and carpenter being considered.

Such results prove clearly that it is worth while to spend capital in a suitable crane outfit. A yard of moderate size should be easily able to build an ordinary cargo steamer of, say, 7,000 tons dead weight in four to five months from laying the keel to launching. That means an annual output of about 7,200 tons of iron or steel work per berth, and be equal to a saving, according to the previous comparisons, of about £1,290, if cranes are used. This would justify

CANTILEVER CRANE ON BREMER VULCAN SHIPYARD AT VEGESACK
BUILT BY THE DUISBURGER MASCHINENBAU ACTIENGESELLSCHAFT (LATE BECHAM & KEETMAN)

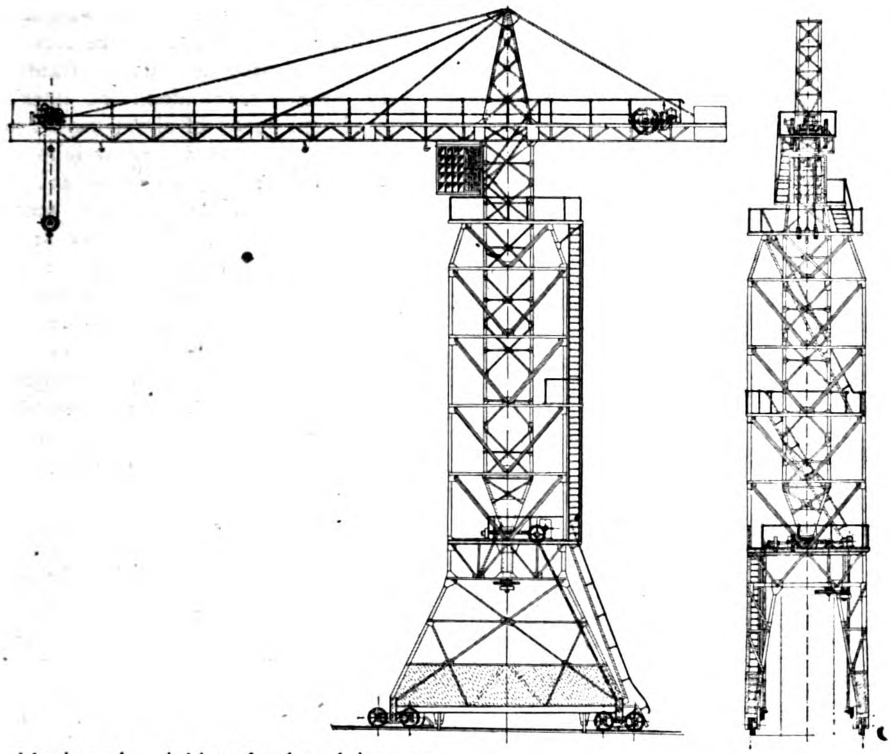


the expenditure of a capital equal to nearly £8,000 above the expense of the masts, winches, and derricks, considering the sinking fund and interest each at five per cent and maintenance at six per cent. The winches and derricks would represent a value of about £600, so that there would always be economy in a good crane service that costs less than £8,600 per berth of a size suitable for building vessels of about 7,000 tons dead weight, and about 400 ft. in length. In the case of larger vessels, I have no doubt that the saving in favor of cranes would be greater in proportion, for not only are the integral parts heavier, but the heights to which they are to be raised are also greater.

In 1902 Mr. Fairburn contributed an interesting description of many types of cranes in use in American yards. Since then quite a number of British and continental firms have introduced cranes alongside of, or over, their building berths. The types adopted vary considerably, some choosing covered berths with overhead traveling cranes, others gantries, and others, again, trolleys running on wire ropes stretched over the berths. To what degree each device is successful can only be judged after a careful study of the results under consideration of the peculiar circumstances of each case.

The cantilever cranes, with which the above experience was gained, are shown in Fig. 4 (Plate II). They were built by the Duisburger Maschinenbau Co., and are more or less similar to those in use in Messrs. Cramp's yard. The steel structure along which they run is 184.5 metres (605 ft.) long, so that they can be used for building vessels up to about 590 ft. in length. Although their work was a considerable improvement on the old method, still it was not what was expected. The berths lie at an angle of about 45° to the bank of the river, causing difficulty in carrying the railway line down the outside of the berth nearest the river. The result is an unsatisfactory approach for the materials. At first it was intended to run the wagons down the line between the berths below the steel and swing the materials out with the small cranes to where the large ones could easily tackle them. This was soon found to be impracticable, and the greater part of the materials was either deposited at the head of the berth directly under the large cranes, or alongside the ship and under the extreme ends of the cranes, the inner lines only being used when the construction of the vessel was beginning. As soon as the side frames were erected, the scaffolding made it almost impossible to work satisfactorily and expeditiously from the center lines. The two cranes were often greatly hampered in having to wait on one another, especially when two vessels were building. If one crane was engaged holding a plate which might be a little more difficult to fix, the other, being unable to pass, lost time in waiting for its neighbor to move on. In proportion to the expense of the plant, it was thought that more might be expected. After about a year's service, it was decided to fit the side cranes shown in the drawing, in order better to utilize the large amount of capital invested in the heavy iron structure, and the

FIG. 5.
TOWER CRANE BUILT BY Mr. LUDWIG STUCKENHOLZ
WETTER A D RUHR.
IN USE IN BREMER VULCAN SHIPYARD



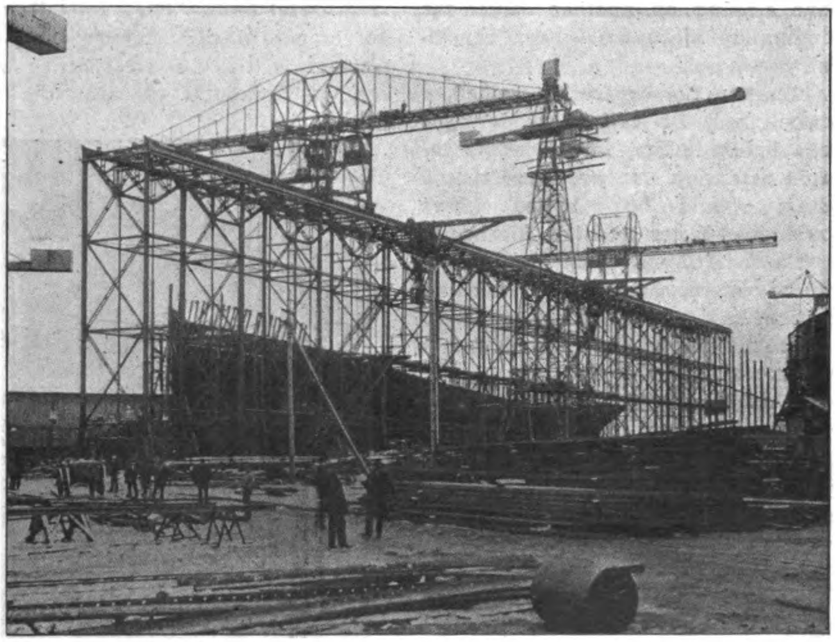


FIG. 6.—CANTILEVER, SIDE, AND TOWER CRANES, BUILT BY THE DUISBURGER MASCHINENBAU ACTIENGESELLSCHAFT. IN USE IN THE BREMER VULCAN SHIP YARD, VEGESACK.

small cranes for unloading the wagons between the vessels were removed, to be more usefully employed by some of the heavy machines in the yard. The addition of the side cranes has proved a very great improvement, nearly doubling the capacity of the whole arrangement. As these small cranes, although they only reach a little beyond the center of the vessels, were able to run along independently of the large ones, the time lost in one crane waiting on another and the bringing up of materials was considerably reduced.

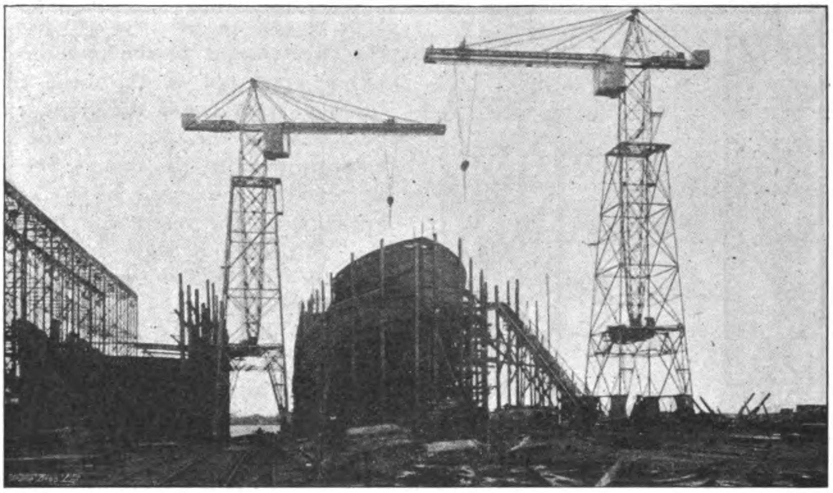


FIG. 7.—STUCKENHOLZ TOWER CRANES AT WORK ON A 7,000-TON VESSEL.

Acting on the experience gained, a careful study of various types was made before taking further steps towards extension. It was clear that a system should be adopted which would give better facilities for bringing the materials to their destination, without intercepting the work of erection, and at the same time to produce a crane of as independent and complete a nature as possible.

The overhead traveling cranes, with skeleton or glazed roof, were considered not quite satisfactory, as, besides their very heavy cost, their facilities for lifting the materials brought down alongside the vessels were not very good. Another very costly type was taken into consideration, namely, strong lattice girders resting on steel towers standing at intervals of about 12 metres along either side of the berth, and carrying one large traveling crane extending the whole width of the berth and several side cranes. This system, similar to that chosen by Messrs. Beardmore for their new yard, is evidently very efficient. The towers have arched feet, so that the materials can be brought down along the ship's side easily to where they are required, and, if the side cranes are arranged to swing as well as travel, there is little difficulty in picking up plates, etc., between the towers.

The type which seemed to offer the greatest facilities for rapid and economical working is shown in Fig. 5 (Plate II). Two of these cranes were installed by Mr. Ludwig Stuckenholz, Wetter a. d. Ruhr., in the end of 1904, and soon proved themselves very useful tools. They are tall walking cranes of the hammer type, and resemble a tower of steel lattice work with a horizontal jib near the top,

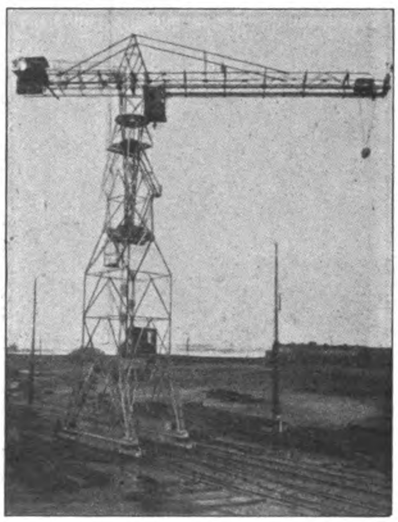


FIG. 8.—TOWER CRANE, BUILT BY THE BENRATHER MASCHINENFABRIK, BENRATH BEI DUSSELDORF.

hence their general name of "tower cranes." On each side of the berth a broad permanent way is built with three sets of rails. On the outer rails, with a 6-metre gauge, the cranes are mounted, and between them two sets of ordinary rails are fitted for transport purposes. The lower part of the crane forms a large arch, through which the steam locomotive crane and wagons engaged in the transport of materials can pass without interrupting the work of the crane in the least. In addition to the counterweight at the reverse end of the jib, the feet are heavily ballasted to ensure stability. These cranes move along the lines at a maximum speed of about 200 ft. per minute; they raise heavy weights up to six tons at a speed of 50 ft., and light ones up to three tons at 100 ft. per minute; their turning speed at the end of the jib is about 250 ft. per minute, and the speed along the jib is about 50 ft. All motions—raising, turning, traveling—have separate electric motors, and are all controlled from the conductor's cab underneath the jib. Electricity is supplied by an underground trolley much in the manner common to tramways, the conducting wires being led along the track in a channel close to one of the rails. Special care has been devoted to having efficient brake power, not only for working purposes but for emergencies. This type of crane has given great satisfaction, and there are now quite a number in use. The Bremer Vulcan Co., in Vegesack, have seven, three from Mr. Ludwig Stuckenholz, Wetter a. d. Ruhr; two from the Benrather Maschinenfabrik Co., Benrath bei Dusseldorf; and two from the Duisburger Maschinenbau Co. (late Becham & Keetmann), Duisburg. The Actien Gesellschaft Weser, in Bremen, have several from the Benrath Maschinenfabrik. In Plate III are given photographs of those mentioned.

Comparing results of work executed by the first of those cranes to be installed, it was found that they worked out about 3 to 4 per cent cheaper than the cantilever types above mentioned. The prices paid for the work were the same, but the men generally got ahead quicker, and finished the work in less time, thus earning more.

The table herewith shows approximately how the various types compare with one another in cost and earning capacity:

The space occupied by a crane outfit is no doubt a great impediment to their adoption, especially in older yards where the berths are generally close to one another. The tower type would require fully an additional 23 ft. clear of the ordinary uprights for carrying the stage planking, and would probably mean, in most cases, the sacrifice of a berth.

Other questions of great importance have to be considered with the introduction of such costly appliances. If they are to be thoroughly utilized, probably many of the methods of working should be revised, and it is not always an easy matter to persuade workmen to take up a new thing which tends to reduce the expenditure on labor. The system most commonly used in building merchant vessels, of putting up the frames and then templating all the plates, is apt to cause stoppages, forcing the machines and cranes to stand still at intervals. Putting on more squads does not always improve matters, as it will seldom happen that they will work harmoniously together. One will often have to wait till the other has finished with the crane, and continued quarreling and discontent will be the result. It is much better to so divide the work that the squad employed in erecting will not be interrupted by marking off, templating, or any other process at all. For that reason the system of laying off as many parts of the vessel as possible (commonly called the long template system) is more suitable. Many continental, and, I believe, also American yards, practice it with good results. Where only one vessel is ordered to one model, it may work out a little more expensive in some cases; but it has very many advantages, and, where duplicate vessels are to be built, the second turns out much cheaper. Considerable time is saved through the absence of ribands, the ship being trimmed into shape by the various plates themselves, with an accuracy almost impossible in the ordinary method. The present tendency is to seek economy by standardizing, not only the various articles of outfit of the vessel, but the vessels themselves. A glance at the yearly reports of ship building shows that the most successful firms have generally built quite a number of very similar vessels. If, therefore, a system were adopted that allows a great many parts to be made to standard templates beforehand, then, surely, it is worth introducing. Once the men are accustomed to laying off, it is not difficult to have the double bottoms, decks, margin plates, stringers, bulkheads, hatches, casings, deck-houses, and the greater part of the shell ready for mounting before the frames are erected. By doing that, the machines in the plate sheds can be kept steadily employed almost from the beginning of the delivery of materials, and there will seldom be a lack of finished articles for the cranes to erect. As the cranes, of course, only work from above the vessel, it is very desirable to lay first the bottom plating and then build up the frames on it, so as to have as few parts as possible to mount which the crane cannot tackle easily. A great deal can be done by carefully dividing the work, so as to ensure a steady flow of material through the works. A fairly good system is to separate the machine work from the platers' work, and divide the plater squads into two minor parts. One part of the plater squad should be confined to marking off, delivering the material ready for the machine squad, and the other part do nothing else but erect. The men employed at the punching, shearing, and other machines do not require to be trained platers, and should have nothing else to do except to work the machines. The foreman, who has special charge of the machine men, must have squads of laborers to bring up the marked-off materials and take the finished articles down to the ship, depositing them within easy reach of the platers erecting.

Type.	Cost including Foundations.	Yearly Expense taken at 16 per cent.	Labor Saving on old Masts or Derricks.	Gain or Loss.
	£	£	£	£
1. Cantilever type, as described	11,500	1,840	1,720	— 120
2. Cantilever with addition of two side cranes..	14,800	2,368	2,580	+ 212
3. Lattice pillars with skeleton roof, carrying three traveling cranes over each berth...	28,500	4,560	2,580	— 1,980
4. Lattice pillars with glazed roof, saving lost time in bad weather..................	32,000	5,120	2,838	— 2,282
5. Lattice pillars with connecting girders, carrying one large traveling crane and two side cranes for each berth............	26,250	4,200	2,660	— 1,540
6. Tower cranes, as described, two cranes per berth, equal to four cranes, and three permanent ways......................	11,900	1,904	2,660	+ 756

NOTE.—For the sake of unity, those values have all been reduced to represent an outfit for two berths 400 ft. long, suitable for vessels up to about 55 ft. broad.

Each manager will have to decide for himself how best to divide the work, according to the local circumstances. It is, however, of vital importance for every ship builder to see that his yard is not only fitted out with the most efficient machinery for the class of work he undertakes, but to see that it is thoroughly utilized. A machine may be able to do its work very cheaply; but, if it stands half the working time, it becomes too costly in the end.

CANALIZING THE UPPER MISSISSIPPI.

Lyman E. Cooley, writing to the Upper Mississippi River Improvement Association, concerning the development of that waterway says:

"In my talk at the Trans-Mississippi congress at St. Paul and the Quincy convention I was full of the matter, as I had gone into the Mississippi river problem so deeply in connection with my studies for the water power development at Keokuk. I then concluded there was no reason why the Mississippi from St. Paul to the mouth of the Illinois should not be canalized for a depth of 9 to 12 ft. In fact, I believe it is more susceptible of improvement than the Ohio river, and the policy has been definitely adopted there of 9 ft., with a probability that it will be increased later to twelve. It seemed to me that the problem, especially for that part of the Mississippi above Keokuk was much simpler than that for the Ohio, and you have a resource in the reservoirs for stimulating the low water flow, which cannot be availed of to any great extent for the Ohio. I believe you should keep on with your channel improvement for a depth of 6 ft., but I would at the same time have exhaustive studies undertaken for these larger depths. In the meantime, what you will do on the six-foot improvement will be a contribution to your ultimate policy.

"It is unfortunate, however, that permanent structures to a depth of 5 ft. should be undertaken, like the locks between your city and St. Paul and like those existing at Keokuk. I am in hopes, however, that some ultimate depth for the locks be insisted upon at the Keokuk water-power improvement, when the same shall be undertaken, and also for the proposed canal at Rock Island. It is important that the ultimate policy be kept in mind in regard to permanent works, if you are to avoid having your possibilities blighted. Beyond such advice as is local to the upper Mississippi, I am advocating a general waterway policy for the country at large. In any comprehensive plan the upper Mississippi would find a place."

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Co.

CLEVELAND.

BOSTON NEW YORK
DULUTH PHILADELPHIA
CHICAGO PITTSBURG
CINCINNATI

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, $3.00 per annum. To Foreign Countries, $4.50.
Subscribers can have addresses changed at will.

Change of advertising copy must reach this office on Thursday preceding date of publication.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C. England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

OCTOBER 4, 1906.

A NATIONAL DISGRACE.

With American ship yards shut down, or partially shut down, with the grass growing over the ways in many an idle American ship yard, with not a vessel building in the United States for the foreign trade, we are suddenly called upon to transfer a few thousand American soldiers less than a hundred miles from our shores, to Cuba. The first thing that the United States government does, after filling its one single available transport with troops, is to charter a British and a German steamship to help it convey this pitiful handful of American soldiers, just across the ferry between the United States and Cuba! And this is the country we are proclaiming a protectorate over! How the Britons, the Germans, the Frenchmen, and the little Japs must laugh at us! With what derision and scorn they must contemplate our plight! The great American nation humbled to this—this as our evidence of greatness!

A couple of years ago we passed a law requiring that all supplies for the use of our army and our navy should be carried only in American vessels. In doing that we conformed to the practices of all other nations of any importance whatever. But we provided that, if the charges were unreasonable, then we should employ foreign vessels. In their frantic efforts to show a record for economy some of our bureau chiefs thought that the rates charged by Americans were too high; so foreign vessels were chartered. Foreign ships were running regularly to Manila, and our army supplies, in small lots, for a few hundred tons at a time, were sent by these foreign vessels. This was practicing economy! Now most of our coal, in cargo lots, for the use of the navy at the Philippines, and all our war stores, are sent in foreign ships, because it is cheaper—it is cheaper!

Doubtless we could find foreign nations, especially Japan, Norway, Italy, and possibly Chile, that would be willing to supply us, on demand, with naval vessels, naval officers, engineers, firemen and sailors. It would be cheaper—why should we not let the foreigners supply them?

In 1903 it was provided that after July 1, 1904, the trade between the United States and the Philippines should be conducted only in American vessels. At once the foreign ship owners, their agents and their friends in this country raised the cry that we did not have enough American ships to do the carrying—a ridiculous and an untrue statement. But this lie was repeated, over and over again, with such insistence, and with such circumstantiality, that finally it was believed. American ship owners protested that their ships were available; they named their ships; other Americans, fully responsible, stated that they were, with the proper assurances, ready to establish an American steamship line to run between American Atlantic ports and the Philippines. All the time the foreign ship owners, their agents and their friends were filling the air with their cries that we had not enough ships to carry the trade with the Philippines—some 60,000 tons annually! Foreigners positively told Americans, in New York, that the law in question would be postponed. Naturally, Americans hesitated to build new ships for that trade. And, sure enough, the time for the law to go into effect was postponed until July 1, 1906. Then American ship owners were told to get busy. But the foreign ship owners, their agents and their friends in this country with one voice proclaimed that the law would again be postponed; this time until 1909, if not indefinitely. Again Americans were afraid to build. The foreigners, and their agents talked so confidently, with such positive assurance, that it looked like they actually knew what congress would do. In the end they proved that they were right. The operation of the law, this year, was again postponed, and, as the foreign ship owners, their representatives and friends in this country had predicted, until 1909. Again they are proclaiming, with an insistence reinforced from their two remarkable successes, in saying that before 1909 they will have the law postponed indefinitely—that the trade between the United States and the Philippines shall, for all time, be left open for the ships of all nations. And, again, probably, no American will dare build a ship for a trade the possession of which is so uncertain and elusive.

Two years ago three great American shipping laws were passed by congress. 1. The law requiring that American supplies for the army and the navy shall be carried only in American vessels. 2. The law postponing the putting into effect the coastwise laws in our trade with the Philippines. 3. The act providing for the appointment of a commission of five senators and five representatives to investigate and

report upon the condition and needs of our shipping in the foreign trade. This was evidence of the renaissance of American shipping; "the new dawn of an American merchant marine." Now, what has resulted? 1. Most of our army and navy supplies are still carried in foreign vessels—a practice that is confined solely to this nation; no other nation allows its army and navy supplies to be carried in any but its own ships. 2. The coastwise laws, as foreigners told us would be the case, will not apply in our trade with the Philippines until 1909—if then. 3. The commission appointed to investigate the condition and needs of our foreign-going merchant marine has at two different sessions of congress pressed its bill upon the attention of that body, with the result that it has passed the senate, and it may—it may—pass the house of representatives!

This the renaissance of American shipping! This the new dawn of an American merchant marine! This the country that, the very first thing it has to do to get 5,000 troops carried to Cuba, not a hundred miles away, must charter a British and a German steamship! It is a national disgrace!

FREIGHT SITUATION.

Ore shipments for September were 5,429,660, a gain of 1,004,110 tons over September, 1905. The Steel Corporation's share was heavy, the vessels of that fleet enjoying fair dispatch. However, the invariable fall conditions of operating now obtain, and the movement from now until the close of the season must necessarily be limited. Lake Erie docks are crowded and it has been a not unusual occurrence for a 10,000-ton steamer to spend five days in port unloading. The proportion of ore going on dock is heavy for two reasons—first the inability of the railways to furnish cars and second the inability of the furnaces to care for the ore even when the railways have been able to furnish cars. This would indicate that some of the furnaces are well stocked with ore. Vessels have got good dispatch at upper lake ports, owing to the completion of the new ore dock, but have been unable to take advantage of it owing to the congestion of lower lake ports. The Steel Corporation is considering retiring its barges in November. With September's fine showing, total shipments for the season will easily exceed 36,000,000 tons. Eight new vessels are still to be put in operation some time during the balance of the season, but their combined capacities for the season will not be over 180,000 tons, which is an inconsiderable amount.

Coal shippers are taking all the small cargoes that are offered, but the movement of coal is not heavy, only a fair amount is coming to Lake Erie docks. Lumber carriers are in good demand all around, and at the meeting of the Lumber Carriers' Association in Detroit this week rates were advanced 50 cents.

Wages aboard ship were advanced Oct. 1, the increase affecting everyone except masters, mates, engineers and first cooks. The second cooks and waiters received an advance of $7.50 a month or $37.50. Wages of porters are increased from $25 to $35 a month; ordinary seaman from $27.50 to $37.50; firemen, oilers, watertenders, wheelsmen and lookouts from $45 to $65 a month. These terms were agreed upon with labor at the opening of navigation.

SHIP OWNERS DRY DOCK CONSOLIDATION.

Negotiations have been under way for some time for the taking over of the plant of the Ship Owners Dry Dock Co., of Chicago, by the American Ship Building Co., of Cleveland, working in conjunction with leading interests of the Lackawanna Steel Co., who are also interested in the Ship Owners Dry Dock Co. Included in the negotiations was a contract whereby there was to be built for the Lackawanna Steel Co. a fleet of steel steamers. The Lackawanna Steel Co. is one of the leading consumers of ore and has established at Buffalo one of the largest steel plants in the world. It is understood that it was its intention to build eight steel steamers for next year's delivery, and to increase the fleet as business demanded. While the negotiations, however, were still in a preliminary state, publicity was given to the plan to the great embarrassment of the negotiating interests, the plan of having the stock of the Ship Owners Dry Dock Co. put in trust being defeated thereby. Mr. Moses Taylor, vice president of the Lackawanna Steel Co., says that there is absolutely nothing to be said now concerning the enterprise. Mr. James C. Wallace, president of the American Ship Building Co., adds that premature publicity has killed the deal, in his opinion, permanently.

WRECK OF CITY OF CONCORD.

The City of Concord foundered off Sandusky in the gale last Saturday night. She had left Cleveland in the afternoon with the barges Negaunee, Montpelier and Donaldson in tow. A valiant fight was made by Capt. McEachren and crew before the vessel was abandoned. The crew of the Concord took to the lifeboats and succeeded safely in reaching the shore fifteen miles away. Three members of the crew perished, two of them refusing to leave the steamer and one jumping out of the lifeboat after he was safely aboard. The barges Montpelier and Donaldson rode the storm out safely. The Negaunee's crew abandoned her, however, reaching the shore in a yawl. The City of Concord was owned by N. & B. Mills, of Marysville, Mich. She was 135 ft. keel, 25 ft. beam and was built in 1868.

FOR NILE SERVICE.

Messrs. John I. Thornycroft & Co., Ltd., have booked an order for a large passenger paddle steamer for Messrs. Thos. Cook & Sons (Egypt) Ltd., for tourist service on the Nile. The vessel is 230 ft. long over all, 51 ft. wide over the paddle boxes, and will draw 3 ft. 4½ in. of water when fully loaded. The speed is to be 10½ miles per hour, the machinery consisting of two locomotive boilers and tri-compound condensing engines. The vessel will have three decks for passengers, also a sun deck over all. Steam capstan and windlass, and steam steering engine will be fitted, and the vessel will be lighted throughout by electricity. The hull will be of mild steel, the decks and cabin house of teak. The builders will build the hull at their Woolston Works, Southampton, and afterwards the whole will be unbolted, packed and shipped to Egypt.

That the McCarthy family is pretty much in evidence on the forward end of lake boats is shown by the fact that Capt. T. McCarthy sails the schooner F. L. Danforth, Patrick McCarthy is mate of the City of Bangor, and Patrick McCarthy is second mate of the J. C. Gilchrist. There are enough others to fill in the subordinate positions. The Murphy family is also distinguished in this way. James Murphy sails the Martin Mullen, Dan Murphy is mate of the Cornell, and Henry Murphy is mate of the Centurion.

Steamer J. H. Sheadle Launched.

The new steamer J. H. Sheadle was launched on Saturday noon of last week at the Ecorse plant of the Great Lakes Engineering Works. Mr. H. A.

MR. AND MRS. SHEADLE ON THE LAUNCHING STAND

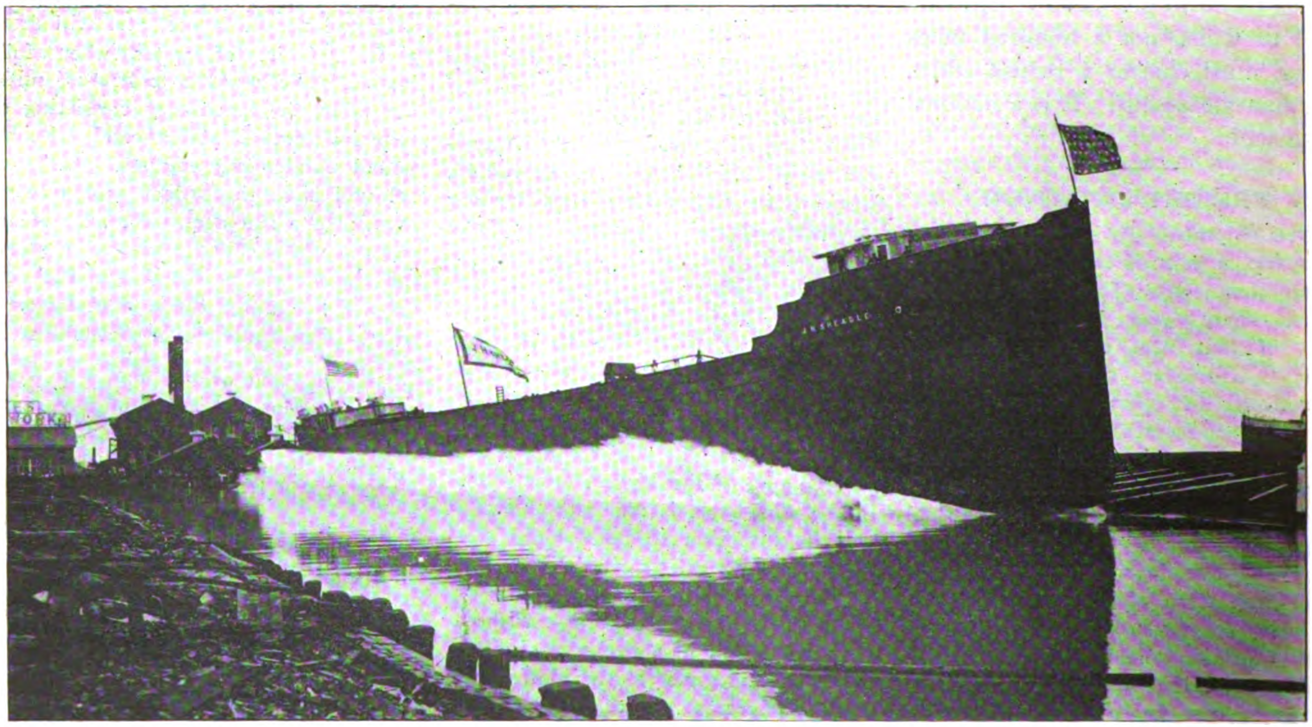
Kelley, of Cleveland, speaking at the dinner given by the ship building company at the Detroit club after the launch, said that monuments in a cemetery are very unsatisfactory affairs at best and that the man whom his friends intend to honor cannot appreciate the full force of the compliment, but that this noble ship named for Mr. Sheadle, still in the fullness of his business career was a symbol of success and stability and that it would stand during his life, and after he was gone, of his worth and his fairness and the esteem in which he is held in every port on the great lakes.

The launch was eminently successful, the ship was christened by Mrs. J. H. Sheadle, and even the elements subsided, the rain held off during the ceremonies and when the word was given the big hull slid gracefully down the ways, landed on an even keel and an instant later the monument to Mr. Sheadle's business career was afloat.

The special car which conveyed the launching party to the ship yard before the launch took them to the Detroit club after it had been successfully accomplished and William Livingstone, president of the Lake Carriers' association, presided at the dinner as toastmaster. The dinner was a thoroughly enjoyable affair and the theme of all the remarks was the man whose name the boat will bear.

President A. C. Pessano, of the Great Lakes Enginering Works, in his remarks said the proceedings of the day were indicative of Mr. Sheadle, that when the ship plunged into the waters of the great lakes as the word to "cut" was given, was in its directness and steadiness of purpose precisely as he had found Mr. Sheadle in dealing for the construction of five ships, and that it was especially characteristic of the man in that it was staunch, clean cut, as perfect as it was possible to get, and that every feature was for the best. President Pessano then took up the question so often heard on the lakes, "What are we going to do with all these ships that are being built?" and answered it by citing the growth of business on the lakes, saying that within his lifetime the tonnage through the Sault canal had increased from 50,000 to 50,000,000 tons during a season of navigation, spoke of the increase of 5,000,000 to 6,000,000 tons each year and said that to handle this increase, this natural growth, would require the services of twenty-five such ships as the Sheadle each year, predicting that within 20 years the tonnage of the lakes would be over 200,000,000 tons a year, and that the builders of ships were simply keeping pace with the times.

Mr. Livingstone in the same line of thought, said the tonnage on the lakes had increased eighty times since 1870, doubled during the past six years and that 1905 increased over 1904 by 10,000,000 tons. He called attention to the predictions of the friends of the Panama canal that within ten years this canal would carry 10,000,000 tons and this with a whole year in which to operate, whereas the navigation of the



Copyrighted 1906 by Detroit Publishing Co.

STEAMER J. H. SHEADLE TAKING THE WATER.

lakes averages but 230 days each year.

Mr. Sheadle, who was then called upon, recalled his statement of a year ago last January, when, at the annual meeting of the Lake Carriers' association he predicted the 15,000-ton ship on the lakes and said that within this short space of time the prediction had been verified within but little over 1,000 tons, and said that the present accomplishments on the great lakes were the merest outline of the developments yet to come on the lakes.

MESSRS. C. E. ADAMS, A. C. PESSANO, J. H SHEADLE, CHAS. A. NICOLA AND F. F. PRENTISS.

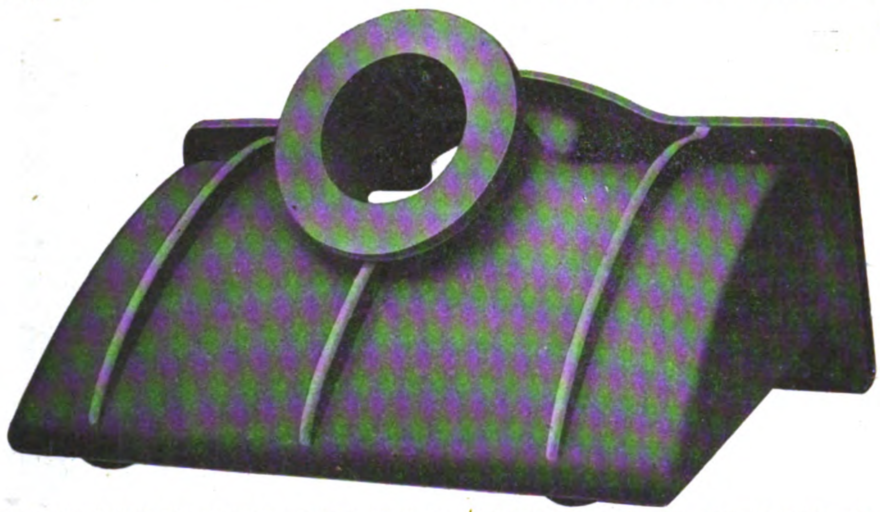
The toastmaster, before introducing Mr. H. A. Kelley, read a telegram from Ishpeming from Mr. W. G. Mather, as follows:

"I regret greatly my inability to attend the launching of the Sheadle. If she proves as capable and staunch as her namesake and, like him, keeps going all the time, she will be a crackerjack. Here's health to 'J. H. Sheadle' and the 'fair sponsor' and 'good builder.'"

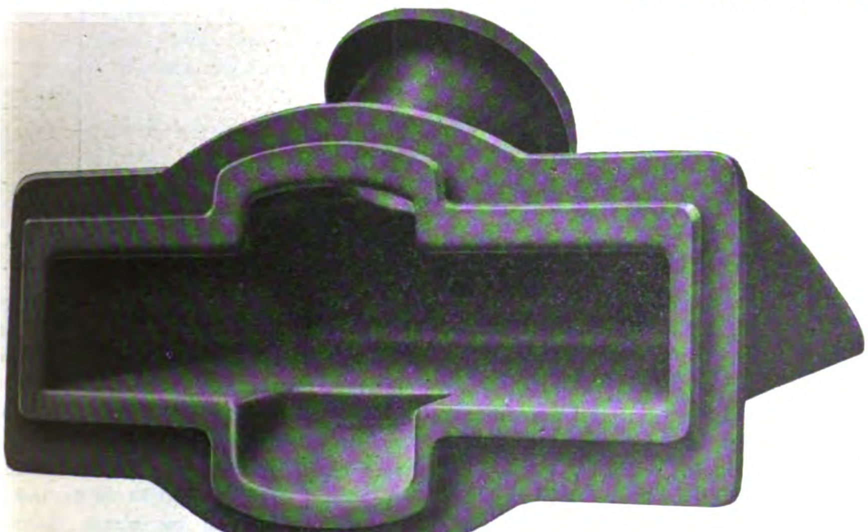
Mr. Pessano replied to this telegram as follows:

"Your telegram received. All your friends at the dinner join with you in sentiment expressed in telegram and send greetings wishing for your speedy return to robust health."

Mr. Kelley, commenting upon the modesty of Mr. Sheadle, in opposing the naming of a boat for himself, said that a man cannot be modest unless he has something of quality to conceal, and then spoke of the eloquence, fairness and ability, of the willingness even of opponents in controversy with his interests, to abide by his decision. Mr. F. F. Prentiss, president of the Cleveland Chamber of Commerce, was the next speaker, being followed by Mr. C. A. Nicola, of Cleveland, who presented the new ship with her colors. Said he was happy to do this for a worthy sistership of a magnificent fleet, and that in Mr. Sheadle the boat had a mascot to give it a long life and a successful career. Mr. C. E. Adams, of Cleveland, said he could not talk as a man who built the boat, the man who owns the boat or the man who keeps both of them out of trouble, but spoke as a neighbor and a lifelong friend of Mr. Sheadle.



INBOARD VIEW OF ANCHOR POCKET. THE CIRCULAR FLANGE IS FOR THE PURPOSE OF CONNECTING TO PIPE LEADING TO WINDLASS DECK.

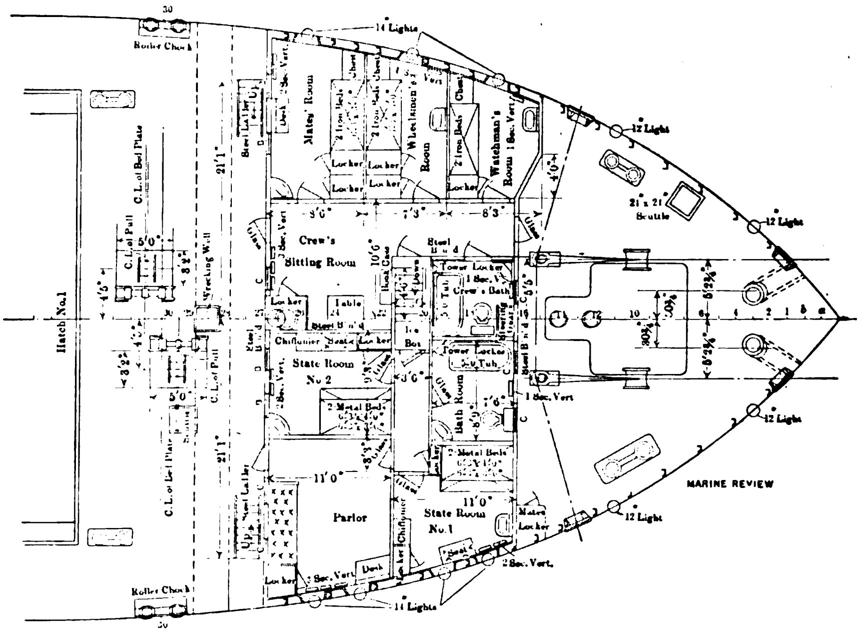


OUTBOARD VIEW OF ANCHOR POCKET SHOWING SHAPE OF OPENING IN BOW. THE WIDE FLANGE IS FOR THE PURPOSE OF RIVETING TO SHELL PLATING.

Mr. Geo. H. Russel, vice president of the ship building company, made one of his characteristic and witty after dinner speeches and afterward all the guests at the dinner joined in singing "For He's a Jolly Good Fellow" as a toast to Mr. Sheadle. The party left for their train and returned to Cleveland.

The guests at the launch and at the dinner following were as follows: Mr. and Mrs. J. H. Sheadle, Mr. and Mrs. Chas. A. Nicola, Mr. and Mrs. A. C. Dustin, Mrs. T. Morris Brown, Miss Bessie Brassington, Mr. Herman A. Kelley, Mr. Horace Andrews, Mr.

Frank F. Prentiss, Mr. Geo. A. Rudd, Mr. Chas. E. Adams, Mrs. A. W. Foote, Mr. E. P. Lenihan, Mr. G. W. Cottrell and Mr. H. N. Harriman, of Cleveland, Mr. A. C. Pessano, Mr. and Mrs. Thos. McGraw, Miss Anna Russel, Miss Margerie Russel, Mrs. J. C. Hutchins and Miss Hutchins, Mr. John R. Russel, Mr. Geo. H. Russel, Mr. and Mrs. Geo. Mattsson and Miss Anna Mattsson and Henry Campbell, of Detroit.

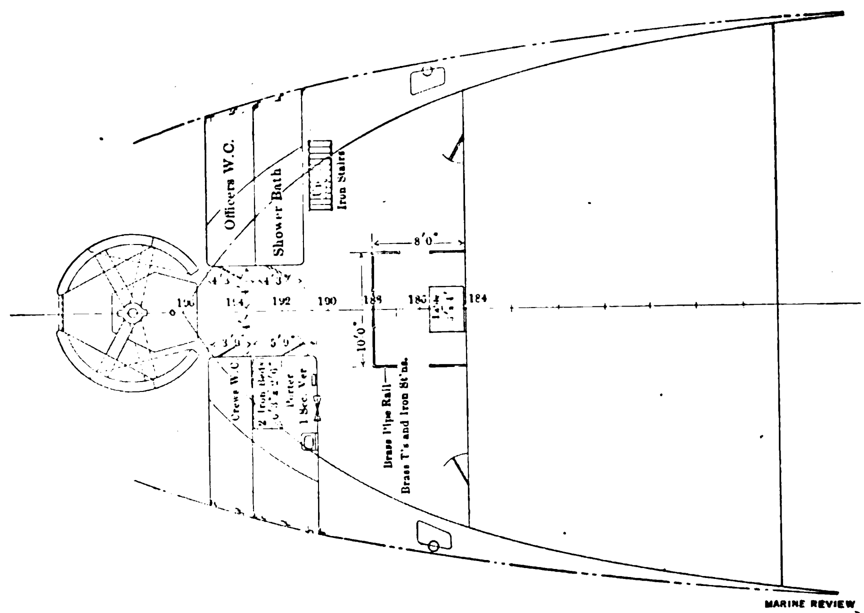


The new steamer J. H. Sheadle is 550 ft. over all, 530 ft. keel, 56 ft. beam and 31 ft. deep. She is built on the arch girder system with straight hopper sides and has thirty-three hatches spaced 12-ft. centers with wooden covers. She will have a carrying capacity of 10,000 tons on 19 ft. draught. She will also be fitted with self-stowing anchors, the pocket device invented by Capt. Joseph Kidd which is doing much to minimize the injuries caused by collisions on the lakes. The anchor will have its flukes stowed inside the ship, leaving nothing outside the hull except the flange or base of the flukes which will close the opening in the hawse pipe, thus leaving the outside of the hull practically without dangerous obstruction. In collisions the projecting anchor usually inflicts greater injury than the actual impact of the ships themselves.

There is to be noted in the Sheadle as in her sisterships, the Michigan and Ishpeming, a return to the old system of having the deck houses flush with the deck. The great advantages of light and ventilation by this system are apparent. While the Sheadle does not differ structurally from any of her great prototypes on the lakes, she does present in her living quarters radical differences. Mr. Sheadle has in this steamer, as well as in the Michigan and Ishpeming, given expression to his own ideas for the comfort of the crew. Sitting rooms have been provided both forward and aft for the members of the crew. These sitting rooms are provided with tables, chairs, convenient lights for reading and a well-stocked library. The libraries embrace about 100 volumes and include books on navigation and on engines and boilers. The libraries in addition provide much solid reading for the men. A careful record is kept of all books called for. It is known that this feature is already greatly appreciated. The line drawings accompanying this article will show the general relation of the sitting room to passenger and crew's quarters. The steward's department is also exceptionally well arranged. A room for the carriage of stores, not usual on freight boats, is provided and details for caring for linen and supplies are given unusual attention,

The propelling machinery of the Sheadle consists of one set of triple-expansion engines with cylinders 23, 37 and 63 in. diameters by 42-in. stroke, supplied with steam from two cylindrical boilers, 15 ft. in diameter and 11 ft. 6 in. long, each having two 44-in. furnaces, working under a system of forced heated draft of improved design, similar to that installed on the steamers Michigan and Ishpeming, and which by actual test has proved to be exceedingly economical.

The electrical equipment of the Sheadle will consist of two 15-K. W. General Electric generators, with 250 light capacity, the generators being direct-connected. A double system of signals will be installed throughout, there being both wire pull and electric service between the pilot house and engine room, as well as on the bridges. The telephone service will consist of two lines, one from the pilot house to the engine room, and one from the parlors to the galley, non-intercommunicative. The vertical lever whistle pull superceded the old crank system on the Sheadle, there being a direct chain and cable with no triangles. A special device, or tell-tale to indicate to the wheelsman on watch, anything happening to the running lights will be installed in the pilot house, this device being the invention of Mr. Carl Penton,



of the Great Lakes Engineering Co., and now in service on about 100 boats on the lakes. The Ray system of telegraph from bridge to engine room will be used. The electrical fixtures, with the exception of those in the parlor, dining room and state rooms will be of the ordinary

J. H. SHEADLE.

marine type, but in these rooms a new design of the Colonial type, specially designed, will be used, the woodwork harmonizing.

Capt. J. M. Johnston will command the new steamer and Thomas Durkin will be her chief engineer.

MEDITERRANEAN TRADE.

Statistics relating to the maritime movements in the port of Genoa in the year 1905 have recently been published. In the total traffic, outward and inward, there were 12,795 movements, representing altogether 12,990,197 registered tons; compared with the year 1904, this is an increase of 519 ships and 919,501 tons. The total amount of cargo discharged in the port was 4,781,739 tons, and 839,271 tons were shipped, being an increase over the previous year of about 210,000 and 40,000 tons respectively.

The Italian flag had the largest share in the traffic of the port, the British came second, the Greek third and the German fourth. Accompanying the statistics are some particulars respecting the shipping companies connected with Genoa. The Lloyd Italiano — a company formed in 1904 — raised its capital last year to twenty million lire, and commenced operations in September with four steamers — two of them running to New York and two to Brazil and Argentina. These boats are intended principally for the emigrant traffic, but four others, two of them being rapid steamers of about 8,000 registered tons, are now in course of construction at Riva Trigoso and Glasgow. The assets of the Italia Steamship Co. — a creation of the Hamburg American line — have been as already stated, appropriated by the Navigazione Generale Italiana, and this company has taken over the coasting trade in the Adriatic Sea formerly worked by the Italia company; the Italia, therefore, now only runs boats to Argentina. No dividend was paid by the Italia company for the year 1905—the line to Argentine ports was worked with a profit, but the loss sustained by the Mediterranean line counterbalanced the gain in the other.

The receipts of the three other large Italian shipping companies were on a satisfactory scale; they all did an active business both as regards passengers and cargo. The Lloyd Italiano has already paid a five per cent dividend for the year 1905, the Navigazione Generale one of 8½ per cent and the Veloce 5 per cent. In order to increase and modernize its fleet, the Navigazione Generale is having eight steamers built and has also purchased two new boats—the British Prince and the British Princess—and in order to accomplish this increased its capital last year by 21,000,000 lire. Of the eight steamers being built, six are intended for the trans-Atlantic trade and two for the Levant service. For the Veloce company three new boats, built in Italian yards, were launched during the year under review, and another of 6,500 tons is now on the stocks in a Sicilian yard. The plan matured by the Navigazione Generale last year for starting a new line to the west coast of South America and Japan has not yet been carried out. As regards foreign shipping companies trading with Genoa, the Ocean line of Antwerp has established a ten-day service to Genoa and southern Italy. On the other hand, the Blue Cross line of Liverpool has suspended its service to Genoa and the south of Italy. The Austrian Shipping Co., Austro-Americana, has also ceased calling at Genoa on its voyages from Trieste to Central America and the West Indies.

ITEMS OF GENERAL INTEREST.

Although no mention was made of it in the daily press, it now appears that the Conneaut Hulett machines have another good record to their credit. The Empire City passed Detroit both ways within thirty-seven hours and a half after unloading 6,275 tons of ore at Conneaut. It took five hours to take off the cargo, and considering the boat's old style construction, the record is an excellent one.

Arthur Wesley Allen, of Detroit, who is steward on the steamer John W. Moore, has just passed his fortieth year as a sailor, having started in as pantryman on the old passenger steamer St. Louis. He was fourteen years of age at the time. He afterwards sailed in the Mayflower, Roanoke, Milton D. Ward, Annie L. Craig, Robert Holland, Dove and later on the Castalia, where he remained for four years with the late C. C. Allen.

Sixty-four years of age and one of the best men on the lakes, is the opinion expressed about Tim McCarthy, watchman on the steamer Howard L. Shaw. He has been sailing on her since she came out and he puts in the winters on an 80-acre farm at Sanilac, Mich. At this advanced age, Mr. McCarthy is credited with the utmost daring in fulfilling the duties of his position. Robert Mullen, his brother-in-law, and Jimmie Mullen, his nephew, are both decking on the Shaw and learning how to steamboat under his direction. Sailing to these three is not only a means of making money, but also an interesting and healthful occupation. The Shaw unloaded at Ashtabula this week.

A POPULAR TYPE OF MARINE ENGINE.

One of the many British engineering firms that has made its way to the very front rank in building a type of marine engine which has found favor with ma-

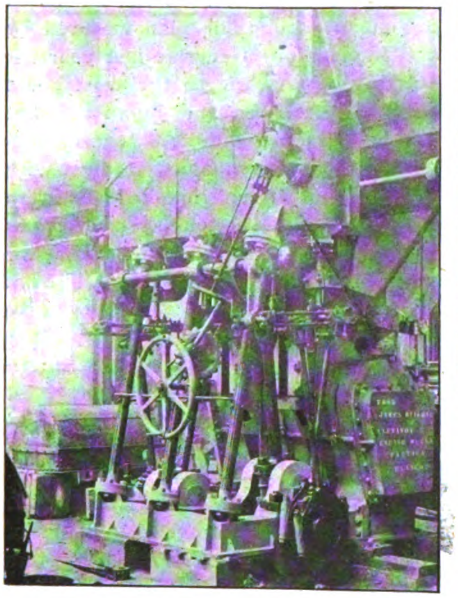


FIG. 2.—COMPOUND SURFACE CONDENSING MARINE ENGINE FOR COASTING STEAMER.

rine engineers is the Glenavon Engineering Works of Mr. James Ritchie, of Patrick, Glasgow. Mr. Ritchie has sent us a number of photographs showing standard types of compound and triple-expansion surface-condensing marine engines, as designed and manufac-

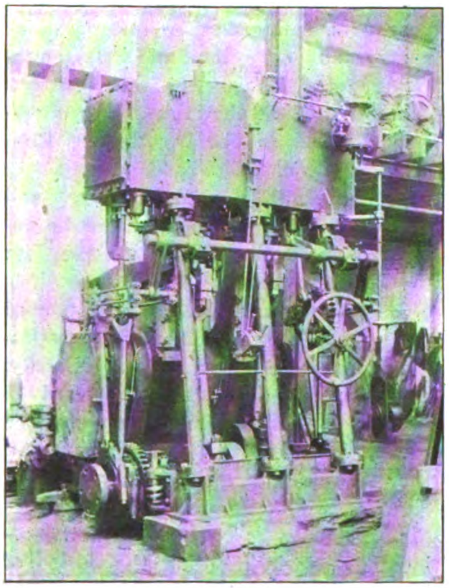


FIG. 6.—COMPOUND MARINE ENGINE FOR SALVAGE STEAMER.

tured by the firm, up to 1,600 I. H. P. Figure 2 shows a compound surface-condensing marine engine for a coasting steamer. The cylinders are 15 and 32 in., by 24 in. stroke, boiler 11 ft. six

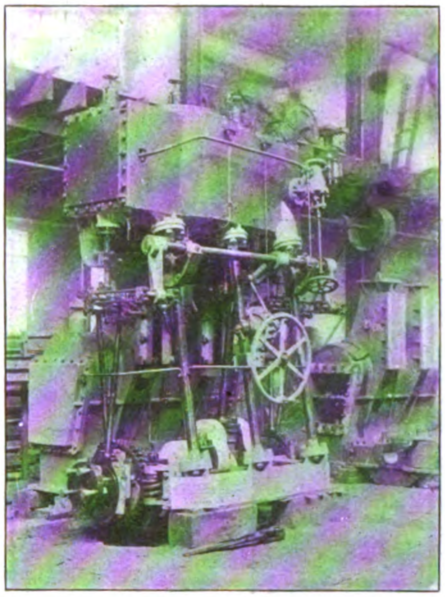


FIG. 5.—COMPOUND SURFACE MARINE ENGINE FOR STEAM TUG BOAT, OPEN-FRONT TYPE.

inches diameter by 10 ft. long, with 130 pounds working pressure. On trial the engines developed 400 I. H. P., working at 120 revolutions. Figure 5 is a compound surface-condensing engine for a steam tug. The cylinders are 15 and 30 in., by 21 in.; boiler, 11 ft. by 10 ft., with 130 pounds working pressure. On trial these engines developed 340 I. H. P., working at 115 revolutions per minute. The propeller being of a large area, specially designed for effective towing. Fig. 6 is a compound surface-condensing engine, 15 and 32 in. by 22 in. stroke; boiler, 11 ft. by 10 ft., with 130 pounds working pressure. These engines were built for a steam tug and salvage steamer, and on trial developed 360 I. H. P. at 115 revolutions. Fig. 7

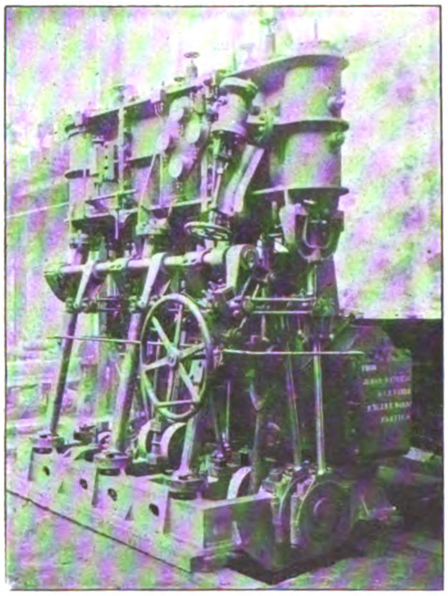
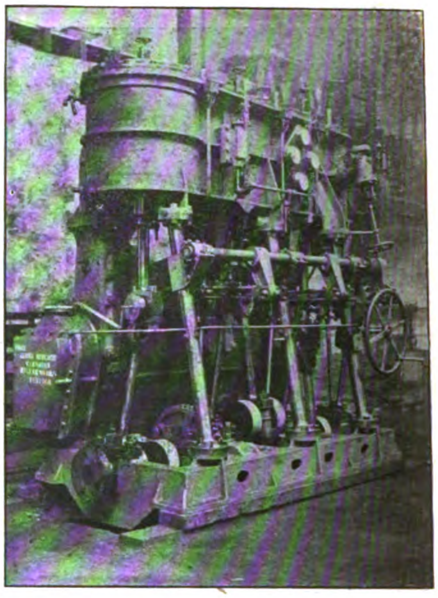


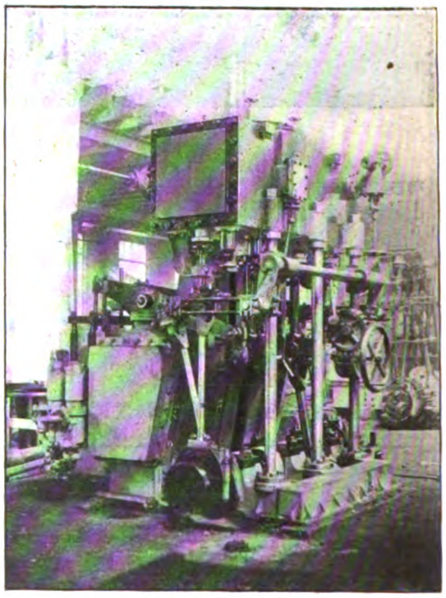
FIG. 7.—TRIPLE-EXPANSION, SURFACE-CONDENSING MARINE ENGINE.

is a set of triple-expansion engines having cylinders 12, 20 and 32 in. diameter by 24-in. stroke; boiler, 12 ft. six in. diameter by 10 ft. long, with 180 pounds working pressure. These engines have been fitted to several steam trawlers.



TRIPLE-EXPANSION SURFACE CONDENSING MARINE ENGINE.

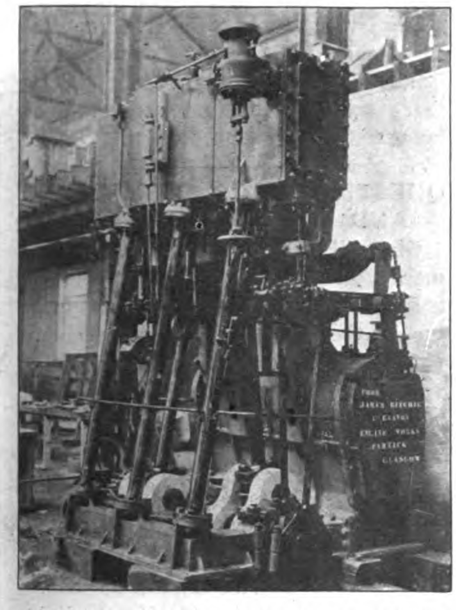
This engine is of heavy type, being designed to provide easy access for repairs, and can be fitted, if necessary, with steam-reversing gear. Working at 120 revolutions per minute, these engines developed on trial 450 I. H. P., vacuum 26 in. All these engines are of standard design, and are all built to



COMPOUND SURFACE CONDENSING ENGINE.

pass Lloyds highest class. The engines are designed with a view to combine strength and durability with facilities for easy access for repair. The valve casings are placed at the end of

the engines, thus allowing free access for overhauling, etc. There are three front columns on the open-fronted type of engine. The whole engine is stiff, and all the bearings are extra strong. The condenser has a very large surface.



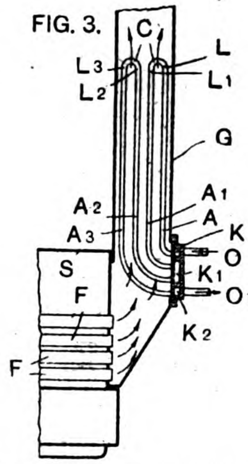
COMPOUND SURFACE CONDENSING MARINE ENGINE WITH PATENT STEAM REVERSING GEAR.

SCHMIDT SUPERHEATERS FOR MARINE BOILERS.

We illustrate herewith two designs of superheaters which have recently been patented by Wilhelm Schmidt, of Wilhelmshohe, Cassel, Germany. In the arrangement shown in Figs. 1 and 2, B is the boiler, F the furnaces, and R the flue tubes. Above the flue tubes three large tubes, H, are provided to contain the U-shaped superheater tubes arranged concentrically therein in several ranges. The outer U-shaped superheater tubes E lying in the outer range have the greatest length, whilst the inner tubes, E_1, E_2, decrease successively in length. At the front ends of the tubes H steam chambers are provided for supplying steam to the superheater tubes and discharging it therefrom, the steam chambers being circularly shaped. The chamber K serves for leading the steam to the long outer superheater tubes E from which the steam passes into the circular chamber K_2 conveying the steam to the U-shaped tubes E_1, from which the steam flows through the shortest tubes E_2 into the steam chamber K_1, whence the superheated steam is taken to the cylinder of the engine.

In the design shown in Fig. 3, the superheater is arranged in the uptake of the boiler. S is the marine boiler, and F the flue tubes arranged therein and discharging into the uptake G. The superheater arranged in the uptake G consists of the tubes A, A_1, A_2, A_3 directed upwards to the points L, L_1, L_2, L_3, where the tubes A, A_1 and the tubes A_2, A_3 are provided with short bends, C C. At their lower ends the superheater tubes are connected with the steam chambers K, K_1, K_2, secured outside of the uptake G. The steam to be superheated enters through the tube O into the steam chamber K and flows from there through the tube A upwards, having the same direction as the fire gases passing through the funnel. At the upper end of the tube A the steam is led over by means of the bend C to the superheater Tube A_1 and now flows downward in the opposite direction to the combustion gases, into the steam chamber K_1, whence the steam flows upwards again through the tube A_2 and thence downwards through the tube A_3 coming into the chamber K_2. From this chamber the superheated steam is conveyed to the steam cylinder.

FIG. 3.



SCHMIDT SUPERHEATER APPLIED TO UPTAKE OF MARINE BOILER.

George L. Simmons, of Detroit, veteran marine engineer, who has been wrecking master of the Great Lakes Dredging Co. at Port Arthur, this season, has resigned his position on account of an injury to his right hand.

FIG. 1.

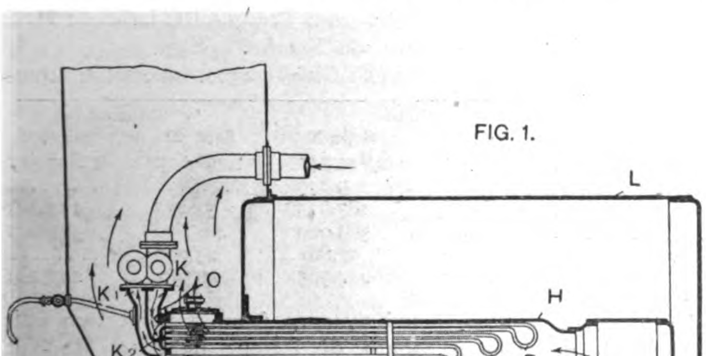
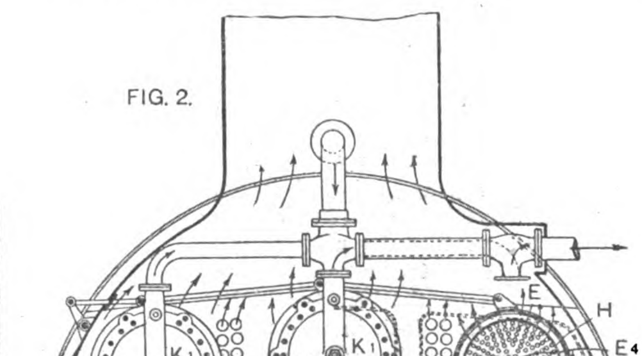


FIG. 2.



SCHMIDT SUPERHEATER APPLIED TO MARINE BOILER.

AT HEAD OF THE LAKES.

Duluth, Oct. 1, 1906.—The figures showing the ore shipments from the docks have just been totaled for the month and show that while the hope of a month ago that 2,000,000 tons would be shipped from the Missabe docks in September has not been fulfilled a splendid gain was made over the movement during September of last year. The Duluth dock however, was the only one of the three to ship more in September than in August and with the full capacity of the docks available in October, that month will doubtless show a corresponding increase over September. The noteworthy incident of the week at the ore docks was the loading of the steamer E. J. Earling, capacity, 10,000 tons at the No. 4 Missabe dock, late Saturday afternoon. No preparations were made for the loading and the attempt to load the steamer rapidly was not thought of until it developed that all the ore for her cargo happened to be in the No. 4 dock, though it was not arranged as is the case in a purely record trial, in a solid section so that all shifting is avoided. In the present instance the Earling came in full of water and in every way the loading was under entirely practical conditions. The boat was at the dock two hours and 15 minutes, of which time delays from the clogging of the ore took 20 minutes and shifting occupied 45 minutes, so that the actual loading time was 70 minutes. While the time of loading for the Earling, which took 9,277 tons of ore, was 45 minutes longer than the record time made at the Allouez docks in loading 10,245 tons into the steamer A. B. Wolvin, the conditions were not as favorable nor were the records at all analogous. The tonnage loaded is not an essential part of the record. Authorities believe that the performance indicates that under record conditions any boat on the lakes could be loaded at the new dock in an hour.

The statement of the ore shipments for September is as follows:

	Two Harbors.	Duluth.	Superior.	Total.
Sept. 21-30, '06	331,827	536,090	287,577	1,155,494
Sept. 21-30, '05	306,491	413,308	186,130	905,929
Increase	25,336	122,782	101,447	249,565
Sept. 1906	1,167,839	1,732,616	869,678	3,770,133
Sept. 1905	1,005,790	1,185,909	698,752	2,890,451
Increase	162,049	546,707	170,926	879,682
Aug. 1906	1,256,883	1,585,922	906,960	3,749,765
Increase	89,044*	146,694	37,282*	20,368
Total to Oct. 1, 1906	6,289,875	8,251,046	4,448,174	18,989,095
Total to Oct. 1, 1905	6,024,148	6,719,506	3,919,731	16,663,385
Increase	265,727	1,531,540	528,443	2,325,710

*Decrease.

In the coal trade, shipments from the docks are in excess of receipts at present and coal docks at this end would like to see more cargoes coming up the lakes. The rate remains at 40 cents. Two record performances have been made recently at Superior coal docks, one at the new M. A. Hanna dock and one at the Northwestern No. 1 dock. At the Hanna dock the steamer Perry G. Walker of the Gilchrist fleet with 7,152 tons of soft coal in her hold was unloaded in 17 hours which time included approximately 45 minutes for shifting, making the actual working time of the hoists 16 hours and a quarter. The dock is equipped with three Mead hoists with a rated capacity of 130 tons per hour each. During the unloading of the Walker this rate was exceeded as the cargo was discharged at the rate of 148 tons per hour per hoist. In unloading the steamer Sill at the Northwestern dock a cargo of 4,200 tons was unloaded by two rigs in ten hours which is at the rate of 210 tons per hour per rig.

The rate for carrying grain to Buffalo has climbed to 2¾ cents as the result of loading two boats at that figure last week. The movement of grain continues to be very heavy with the receipts of wheat in particular much greater than the shipments. This is true both of Duluth and Fort William. The entire movement of grain both in receipts and shipments was much heavier in September of this year than in the same month of 1905, the excess in both instances being in the neighborhood of 1,500,000 bushels. The statement for the past fortnight is as follows:

	Receipts		Shipments	
	Sept. 22	Sept. 29	Sept. 22	Sept. 29
Wheat	2,487,553	2,842,741	1,496,617	1,825,317
Corn	7,129	9,830	....	....
Oats	176,113	187,645	52,275	173,493
Barley	541,454	583,060	427,636	578,802
Rye	17,316	27,801	25,000	....
Flaxseed	309,573	444,995	21,530	247,289

A strike of the longshoremen involving over a hundred men is in progress at Fort William and Port Arthur and several boats have been delayed in unloading among them the Athabasca and the Ionic. The demands of the men are for an increase in pay to 25 cents for day work and 30 cents for night work. It is reported that some destruction of property has occurred and at the present writing there seems to be no prospect of an immediate settlement.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 13.

Give all shoals and principal landmarks passed on either hand.

In taking true courses to make good the mean correct magnetic course you should take the mean of variations at the ends of course.

132. Give correct magnetic course and distance from Lake Huron lightship to Goderich.

133. Give correct magnetic course and distance from Lake Huron lightship to Kincardine.

134. Give correct magnetic course and distance from Lake Huron lightship to either entrance Southampton.

135. Give correct magnetic course and distance from Lake Huron lightship to a point three miles W ½ N from Cove island light.

136. Give correct magnetic course and distance from a point three miles ENE from Presque isle light to Poe's reef lightship.

137. Give correct magnetic course and distance from Poe's reef lightship to Mackinac.

138. Give correct magnetic course and distance from a point three miles ENE from Presque isle light to Mackinac via North Passage.

139. Give correct magnetic course and distance from a point two miles south of Detour light to Mackinac island.

140. Give correct magnetic course and distance from a point two miles south of Detour light to ranges at Cheboygan.

141. Give correct magnetic course and distance from a point two miles SE by S of Detour light to a point three miles W ½ N of Cove island light.

John M. Conroy, of Buffalo, has been temporarily put on the steamer John Ericsson as second engineer.

QUESTIONS FOR MASTERS AND MATES.—NO. 12.

175. How many degrees of longitude equal one hour of time?

176. Is the length of a degree of longitude greater on the equator than elsewhere on the earth?

177. The length of a degree of longitude on the parallel of 60 degrees is just one half the length of a degree on the equator; in one hour's time does the sun pass over or through the same number of degrees on the equator as on the parallel of 60 degrees?

178. If the degrees of longitude vary in length in different latitudes, how do you account for the sun passing over the same number of degrees in a given time in all latitudes?

179. Show that the influence of the earth's magnetism upon a magnetic needle is merely directive.

180. How can the intensity of different parts of a magnetic field be roughly estimated from the behavior of a magnetic needle?

181. A coal bunker 25 ft. in length by eight feet in breadth and 10 ft. in depth will hold how many tons of coal, figuring the coal (soft) at 45 cu. ft. to the ton?

182. There are 231 cu. in. in a gallon of water. A cubic foot of water (equals 1,728 cu. in.) weighs 62.42 lbs. A tank 20 ft. long by five feet wide and four feet deep filled with water will hold how many gallons and what will be its weight?

183. Does an isogonic line indicate the direction of the magnetic needle?

184. The wind is N x E, a vessel sailing close hauled, heads NE x E ½ E on the port tack, how will she head by compass (no deviation) when close hauled on the starboard tack?

185. If a sailing vessel can steer 5½ points from the wind when close hauled, how will she head on the starboard tack with the wind SE?

186. A sailing vessel close hauled heads SW, and is 4¾ points from the wind being on the port tack, what is the direction of the wind?

187. Your boat carries 6,000 tons of coal; figuring 40 cu. ft. to the ton, how many bushels of space does your coal cargo occupy, allowing 2,150.5 cu. in. to a bushel?

188. Ore, coal, etc., is carried by the gross or long ton (2,240 lbs.) but the boat gets pay only for net tons, that is, she must carry 2,240 lbs. to get pay for 2,000 lbs. The steamer H. H. Rogers recently carried 15,000 gross tons of ore, for how many tons did she receive pay?

189. How many fathoms in a nautical mile?

QUESTIONS FOR OILERS AND WATER TENDERS.—NO. 9.

81. What is meant by the center of gravity of a body?

82. What is meant by the center of gyration?

83. What is meant by the center of oscillation?

84. What are the mechanical powers and what is meant by them?

85. What is the weight of a hollow copper ball commonly used in traps, outside diameter 6 in. and 1-16 in. thick?

86. How many cubic feet of water will be extracted by a bilge pump per hour, diameter of plunger 3 in. and 14 in. thick, 50 revolutions per minute the pump being ⅝ feet each stroke?

87. Explain in simple language the gain by expanding steam.

88. If a cubic foot of steam of 10 lbs. pressure be compressed into ½ a cubic foot what will the pressure be? If expanded into (2) two cubic feet how much, temperature remaining the same?

89. What is the better bridge wall a straight or semi-circular one?

90. What distance should there be between the grates and fire sheets?

AROUND THE GREAT LAKES.

Stages of water are somewhat lower and vessel owners are advised to load only to 18 ft. 10 in. hereafter.

William J. Farrell, of Duluth, who is known to many of the lake mariners, made a trip down the lakes last week.

The steamer Huron City, owned by Capt. Harris W. Baker, of Detroit, has been sold to the Mud Lake Lumber Co. of Cleveland.

The schooner J. V. Taylor was badly pounded in a storm on Lake Michigan last Friday and had to be put in dry dock at Chicago.

Harry Endelman, second engineer on the steamer La Salle, got off for a trip when she struck Erie last week, on account of the illness of his wife.

Captains in the Pittsburg Steamship Co.'s fleet expect to hear great results from the steamer Manola on account of a new marine developer which is being experimented with.

Capt. W. S. Shay, shore captain of the Rutland line, who has been looking after the loading of steamers of that fleet at Cleveland, has been transferred to Chicago where he will perform similar duties.

While the steamer J. G. Brower was making a shift in the river at Ashtabula last week, she struck a boom of the Hoover & Mason machine on the No. 5 dock, causing damage which will keep the machine out of commission for at least two weeks.

Ira Brake, of Marine City, has made many friends this season by his work as a marine reporter. He will take off or put aboard passengers on passing steamers either day or night. His day signal is four whistles and a night call can be arranged by telegraph.

The steamboat inspectors at Buffalo suspended the license of Capt. Merritt N. Byrnes, of the tug Delaware, for six months, and of John K. Killela, of the tug E. E. Frost, for thirty days as punishment for reckless racing in Buffalo creek on Sept. 19, which resulted in the drowning of fireman Thomas of the Frost.

The Canadian steamer Rosemount is in dry dock at Superior for repairs to her bottom. She grounded while going up the lakes with a cargo of coal, going ashore near Detour. The Rosemount is a steel vessel and seventeen of her plates are damaged. Capt. Joseph Kidd, of Duluth, surveyed her for the underwriters.

Four steamers delivered on the Calumet river on Monday of this week a total of 44,850 gross tons of ore, the largest average ever received at the port. The steamers making this record were the Harry Coulby with 10,350 tons, the J. Pierpont Morgan, 11,500 tons, the George W. Perkins, 10,500 tons and the Wm. E. Corey, 12,500 tons.

The steamer Fayette Brown struck the pier while trying to make the harbor at Lorain in the gale which swept over Lake Erie on Saturday last and was beached. She was released later and put in dry dock at Lorain, where it was found that she had sustained damages consisting of a hole 4½ ft. by six feet in her stern and that her wheel was practically ruined.

Ashtabula will never be able to boast of a harbor, and notwithstanding this fact the city authorities appear to be lax in keeping what harbor there is free from obstructions. The ever-present bar at the bend below the bridge is bad enough, but big timbers and all kinds of driftwood make it infinitely worse. With any kind of low water, the incoming freighters have trouble getting up to their docks.

Thomas Drein & Son, Wilmington, Del., request the MARINE REVIEW to deny certain rumors that are being circulated among the trade that the firm has gone out of business. The business is being conducted by the estate of the late Wm. M. Drein, is filling all contracts made before his death and are also taking in new business.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Tank Top Plating. Fig. 61 shows the method of laying off a tank top plate.

C strake port—No. 11, which fits over frames Nos. 100 to 107, as shown on plan. The lines not numbered are the intermediate angles under the tank top plating, and the numbered lines are the angles which run from the center keelson to the ship's side, which have been referred to as tank top angles.

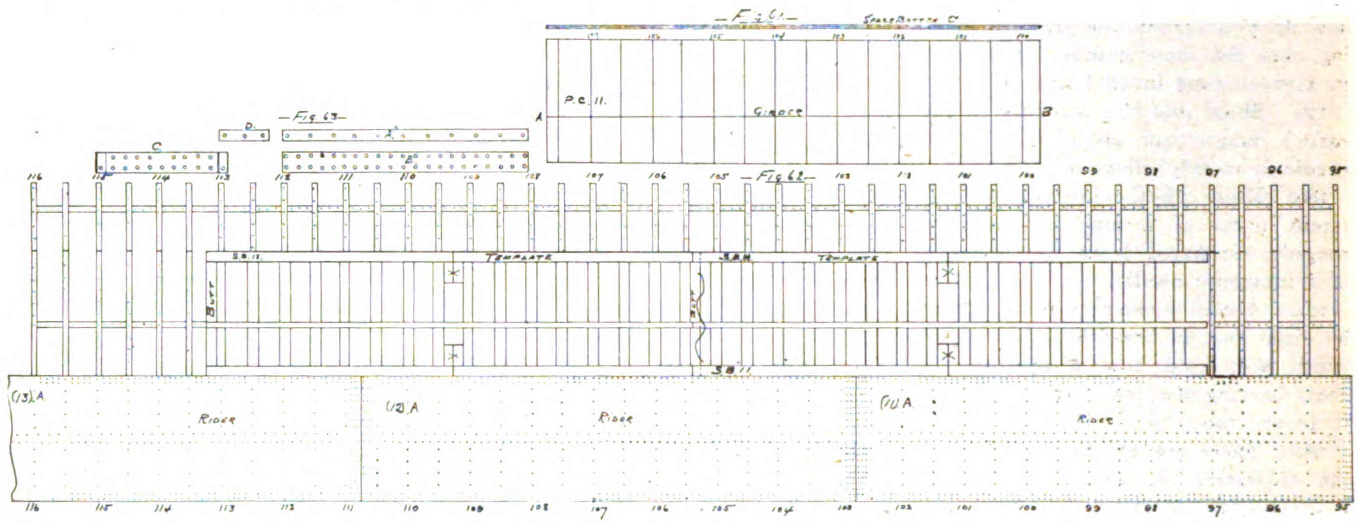
P C 11, Fig. 61, is square and the angles are all parallel 18 inches apart, which, after the width of plate is put on, are squared off from one of the edges. These lines are obtained from the space batten C.

The workmen laying off the work are never allowed to make any measurements, battens are always gotten from the mold loft, and these battens are returned to the mold loft when not in use and there checked often as to sizes.

Line A B is the girder line which is put on parallel to one of the edges of the plate, P C 11. Fig. 63 shows the molds used for marking the rivet holes, viz.: A is the frame rivet hold mold; B, butt mold; C, seam mold, and D, girder mold. These molds are all made so that the molds, if turned upside down, will not make any difference as far as the location of the rivet holes is concerned.

This tank top plating is edge and edge work, which necessitates the planing of the plate all round, as well as countersinking all the holes in the plate. The marking of the tank top plating is practically the same method as laying off the bottom shell plating, with the exception that the bottom shell plates are all lapped and the tank top is edge and edge. All straps and edge strips are laid off with the plates.

The tank plating at the side is treated similarly to the side shell plating.



The top of the plating of tank at side is the main deck and the seams of the tank side plating run parallel to the deck and sheer. Fig. 62 shows part of the tank top in place and three plates on A strake, which is more often called the rider plate. Two templates are shown in place for copying tank top plates, B, 11 and 12. This is the method practiced in Scotland for securing the rivet holes and shape of plates on tank top.

The same method is practiced on the tank top as on the shell plating. The edges are all lined in and the width of the plates measured to make sure of the material being the right size. This tank top plating is all edge and edge work, and when finished the top of the tank is flush, making the most expensive style of tank top plating. The process of laying off a tank top of this style is to put on the rider plate strake, this strake is marked A, then proceed with the next strake, B.

The templates are cut in two pieces, as described before. X shows where they are butted together.

It will be seen that the template reaches spaces from 98 to 113, covering two plate lengths. B 11 butts between frames 105 and 106 and B 12 between 113 and 114, the template B 12 is left on the vessel, and when B 11 is marked the template is returned to the vessel and put on the end of B 12. In this way the whole strake of plating is marked, which saves waiting for plates to be put in place, so that another plate may be marked from end of same.

The molds B and C, Fig. 63, are used for marking the plate butts and edges in order to have the holes opposite each other on the butts and edges.

The tank top angles are all connected to the girders and all the work riveted under the tank top plating before the plating is proceeded with.

All the straps for the plating and edge strips are marked from the tank top plates when the plates are in place and bolted up.

It will be noticed that no chances whatever are taken in templating the work. All the girders are completed and riveted before the plater commences to template the work.

On the lakes all the work is going on at the same time, but the work is all riveted up in the tanks before putting the top plates in place. The greatest of care is necessary in keeping the tank top angles and girder clips in correct position or unfair work is sure to occur.

A plate 24 ft. x 6 ft. x 20 pounds would cost in Scotland to mark, punch, roll and erect in place, seven dollars and twenty-five cents ($7.25). On the lakes it would cost two-thirds that price and all the other work, such as strips and straps cost only two-thirds of the Scotch prices.

ENLARGING ITS PLANT.

The National Metallic Packing Co., Oberlin, O., recently purchased some land adjoining its present shop and is now building a large factory and is equipping it with the most modern machinery, to be used exclusively for the manufacture of metallic packing. This company which has been exploiting the railway field for three years past, entered the marine field early last spring and has met with pronounced success. The enlargement of its plant is due to the great increase in its business on the great lakes as well as on ocean-going vessels. The company has received a number of excellent recommendations from vessel owners, stating that the packing has given perfect satisfaction. This packing is milled from the best grade of charcoal iron, having a square and tangent cut interlocking, doing away with any doll pins. It glazes the rods perfectly and conforms itself to any size of rod. It is guaranteed to be absolutely steam-tight under all conditions.

STRESSES IN EYE-BARS.

(From *Engineering* London.)

It will be remembered that during the discussion and correspondence which took place about a year ago with regard to the strength of masonry dams, and the nature of the stresses brought about by the weight of the dam and the press-

Fig. 1.

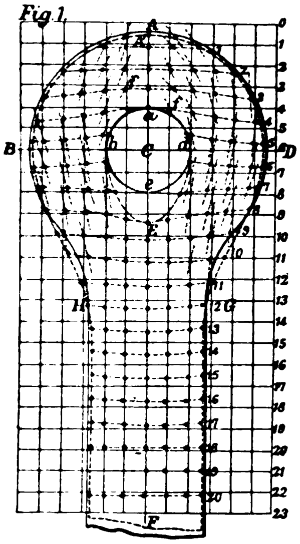


Fig. 2.

ure of water against it we published the results of some very interesting experiments made by Messrs. J. T. Wilson and W. Gore on a section of a model dam made of rubber. These experiments showed with remarkable clearness the direction and nature of the stresses under the conditions of loading employed. The advantage of rubber for such purposes is, of course, clear, the great flexibility of the material under low stress giving much greater distortion than a more rigid material under similar conditions. The suitability of rubber for experiments of this nature was recently taken advantage of in America by Mr. John D. Van Buren, in order to show the deformation in the head of an eye-bar, similar to those used in bridge work, when subjected to tensile stresses.

In a paper on the subject of eye-bars, by Mr. Theodore Cooper, published in the *Proceedings* of the American Society of Civil Engineers, in January last, the writer points out that our knowledge of the stresses in the heads of eye-bars, when subjected to tensile loads, has been more or less vague, and that assumptions have been made that are not in all cases warranted. The arguments he puts forward are the result of a series of experiments on full-size eye-bars of steel which were tested to their ultimate breaking loads, and the distortions of the head, caused by the increasing stresses, duly noted. These bars were 15 in. wide, and from $1\frac{3}{4}$ in. to 2 1-16 in. thick, for pins 12 in. in diameter, and were similar to those intended for the Quebec bridge. Before the tests were carried out the heads of the bars were scribed over the face with a number of fine lines at right angles to the axis of the bar, and others parallel to the axis. The distortions, under stress, of these lines at different parts of the head were duly noted.

Steel being, of course, a very rigid material compared with rubber, the distortion of the lines as the load increased was exceedingly small, and required very careful measurement to ascertain it accurately. The rubber model of Mr. J. D. Van Buren is therefore of particular interest as showing the effect of comparatively small increases of load on the material of the bar surrounding the pin. Fig. 1, annexed, is an illustration in diagramatic form of this effect. The dimensions of the rubber bar used for the experiment were: Neck, $1\frac{3}{8}$ by $\frac{1}{2}$ in.; eye, $2\frac{3}{4}$ in. in outside diameter; and pin, 1 in. in diameter.

The bar, as it appeared before the application of the load, is shown by the full lines, with the full-line squares drawn on it. The dotted lines show the form which the bar and the squares took when the load was applied. The hole for the pin, after distortion, is shown by the dotted line *a b* E *d*, and the direction of the strains or flow are given by the slanting lines *f f*, etc. The corners of the squares, after distortion, are shown by the small dots. The stress at any particular point is denoted by the difference between the areas of the original and the distorted squares, or between their sides and diagonals.

It appears from the rubber model that the maximum stress is in the region of the pin along the lines *b* E and *d* E, where it is very great, as may readily be seen from the distortion produced. The stress along the outer edge from D to line 8 and from B to line 8 is not nearly so great. There is evidently a strong bending action on each side of the pin, just below the line B D, the tension at the pin being thereby increased, while it is reduced at the outer edges, a result that theory would have led one to expect. From the point *a* directly in front of the pin to the point A there is compression for about half the distance, after which there appears to be tension, and the top of the eye, above the lines 4 and 5, seems to act like a beam. At E there is compression, clearly shown by the distortion. Commencing near *b*, cutting *a* A below A and ending near *d*, there is a curved boundary of shearing stress surrounding the compressed area.

In addition to the change of shape, as denoted by the lines on the face of the head, there were also considerable distortions in thickness; and although it is not easy to formulate the relation between the distortions in the plane of the face of the bar and those in the direction of its thickness, the author of the paper considers that it may be quite possible from models such as he used to obtain a safe guide as to the shape of the eye that will give the greatest possible uniformity of stresses, and that, apart from the difficulties of manufacture, his experiments point to a head somewhat in the shape of Fig. 2 as the most suitable, in order to reduce the excessive distortion in the neighborhood of the pin. We think that perhaps Mr. Van Buren might even have gone a step farther, and thickened up the metal at the back of the pin, where the maximum stress comes, and not made it the same thickness as at the sides.

It is interesting to note that the distortions produced by various stresses in the rubber eye-bar, when compared by Mr. Theodore Cooper with those produced in large steel eye-bars, correspond exactly in character with those of the latter.

It appears from experiments both on steel and rubber eye-bars of the usual form that the elastic limit in the head is reached before that in the bar proper, and it is not difficult to see that this is due to the high compressive stress in front of the pin, owing to the small surface between the head and the pin. The bearing area between the head and the pin is usually considered to be that obtained by dividing the total tensile stress on the bar by the product of the diameter of the pin into the thickness of the head. As, however, these pins never fit the holes perfectly, this method cannot be correct, the actual stress caused by the bearing of the pin being much greater than that given by this rule.

As is well known, the shape and size of the heads of eye-bars have often been varied in order to meet these excessive stresses, as, for instance, by adding material to the eye in front of the pin and adding certain percentages to the cross-section at the sides. The thickness of the head has also been increased above that of the bar. The use of harder steel for the head of the bar has been proposed, but this latter does not seem altogether practicable unless the bar itself be made of the same material as the head, in which case the allowable unit stresses would be taken higher, and nothing would therefore be gained.

A way out of the difficulty has been suggested, which is to give the hole for the pin an oval shape, the shorter diameter being a little larger than the pin, and the longer diameter being sufficient to give the pin ample clearance. In order that the pin, when first brought into bearing, may not quite touch the front surface of the hole, but bear along the head at two places on each side, the curvature of the oval in front of the pin should be slightly different from that of the pin, and such that when a certain tensile stress is on the bar the radial

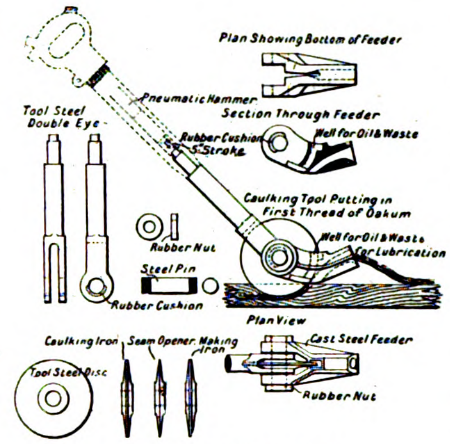
compressive stress between the pin and the bar may be practically equal over an arc of 120 degrees. There appears to us, however, to be very serious practical difficulties in the way of this proposition, and the method would, no doubt, add considerably to the cost of the bars. On the other hand, an eye-hole formed on these lines would no doubt considerably reduce the stresses around the pin, and, at the same time, the difficulty of inserting a pin through many bars in erection would be much lessened.

Distortions such as we have described are, however, not confined to eye-bars, but are common to all connections where loads are applied more or less at a point, whether the members stressed be in tension or compression. All designs must to some extent possess this defect, which is unavoidable, unless there be sufficient material in the connection to distribute the stresses properly. In a measure the difficulty may be overcome by thickening the heads, and also by making them elliptical, with extra metal behind the pin. In the days of iron heads this was the practice, and there are engineers who still consider (and we think rightly so) that when steel took the place of iron the elliptical shape should not have been departed from. It is not easy to see why the circular form should have been adopted for steel, when all experiments on iron bars seemed to show that the elliptical form was the right one.

The experiments to which we have alluded, although showing that the stresses in the head of an eye-bar of the usual form may be, and probably generally are, in practice, much higher than the stresses in the body of the bar, such liberal allowances are made in factors of safety that we do not consider there is the slightest ground for anxiety as to the safety of bars in existing bridges. Experiments such as those carried out by Mr. John D. Van Buren are, however, extremely interesting, and may prove of value and importance in computing the camber of long spans.

A DECK-CAULKING TOOL.

The usual method of caulking the wooden deck of a ship is by hand. It is expensive as well as laborious, and in recent years has given way, to a considerable extent, to more expeditious methods, which involve the use of machinery. A neat tool for this purpose has recently been brought out. It is known as the Palmer and Webster pneumatic deck-caulking tool, and is constructed by the Pneumatic Engineering Appliances Co., Ltd., of Palace Chambers, Westminster. The illustration we give needs little explanation. The apparatus consists essentially of two parts, the feeder and the hammer. The latter is a standard pattern pneumatic hammer, called the Thor, which is made by this firm. The feeder is made of cast steel, and is arranged to be fitted to the rest of the apparatus by means of a steel pin, which passes through a double eye-piece,



DETAILS OF CAULKING TOOL

through which the power of the hammer is transmitted. To minimize injury to the bearings owing to the action of the blows, a rubber cushion is placed in each eye-piece and also in each eye of the holder. These can be seen in the drawing. The pin acts as a spindle for the caulking discs, of which there are three kinds. The seam opener is used to open the seam to the required width to receive the oakum. Then the caulking tool is employed to insert the first caulking thread. Finally two threads of oakum are caulked down on the top of the first thread by means of a third tool, called the maker. The oakum is laid down on the seam in long lengths, and one end threaded through the nose of the feeder, as shown in the illustration. As the feeder is moved along, the oakum is automatically picked up. The machine is capable, so it is claimed, of doing much more work than it is possible to do by hand with ordinary tools—in fact, it is said that two apprentice carpenters can caulk 690 ft. a day with two tools. Further, the firm states that for drumming decks one apprentice can do 900 ft. in one day.

THE CARE AND OPERATION OF NAVAL MACHINERY IN THE ENGINEER DEPARTMENT, U. S. NAVY.

BY LIEUTENANT H. C. DINGER, U. S. N., MEMBER.

(CONCLUDED.)

VACUUM.

The maintenance of a good vacuum is a most important aid to economy. This depends on the proper action of air pump and a sufficient supply of circulating water and on the tightness of parts of condenser and exhaust system.

A loss of vacuum may be accounted for by leaks in exhaust pipes whereby air is drawn in. This may be through open exhaust valves of auxiliaries not in use (chief cause), leaks around stuffing boxes of exhaust valves or other valves leading to condenser, leaky low-pressure piston-rod stuffing boxes; leaks in exhaust joints or joints on condenser, defective air pump. In these cases condenser remains cool.

If vacuum drops and the discharge from air pump is found to be hotter than usual, the circulating water is not sufficient. This may be caused by an extra amount of exhaust steam, a slowing down or stopping of the circulating pump, or a stopping up of injection pipes, in which case these pipes will become hot. The division plate in condenser head, or the valves connecting injection and discharge may leak, and thus water is allowed to short circuit without passing through condenser tubes. In the above cases the condenser will become hot.

A ready indication of loss of vacuum is the slowing of the engines or a dimness of the electric lights when dynamo exhaust is turned on main condenser. A loss of vacuum shown on gauge without any other indication of change is probably due to the gauge pipe becoming plugged up, or a cock or pipe may be closed.

AUXILIARIES.

The auxiliaries, air, circulating, and feed pumps, are likely to give the most trouble, and these require constant attention and oversight.

AIR PUMP.

Separate air pumps, when running very slow, may sometimes stop. Usually the steam end of the air pump gives very little trouble.

The principal trouble with air pumps is the water valves carrying away. If bucket valves are gone the vacuum will drop very materially and the speed of pump will increase. If

foot valves go vacuum will not drop but pump will work jerky and hard, vacuum gauge will move with pump. If bead valves are gone vacuum will decrease somewhat and pump will work with a somewhat jerky movement.

Air pumps may become overloaded with water, due to some obstruction in pipes. This will cause them to thump and the vacuum to drop.

The stuffing box of air pump piston rod should be kept tightly packed with flax packing, and the gland may from time to time require setting up while running.

With independent air pumps, the valve gear must be kept in proper adjustment to give proper length of stroke.

CIRCULATING PUMP.

This, as a rule, only requires regulation and oiling. The speed of the pump should be so regulated that the temperature of the discharge water is a little, not over 20 degrees below the temperature corresponding to the vacuum that is being maintained. To have this temperature much below the temperature corresponding to the vacuum is simply throwing away heat by means of the circulating water and reducing the temperature of the air-pump discharge.

The temperature corresponding to vacuum is as follows:

28 inches......	100 degrees Fahr.
26 inches......	125 degrees Fahr.
24 inches......	140 degrees Fahr.
22 inches......	152 degrees Fahr.
20 inches......	161 degrees Fahr.

The runner is sometimes likely to come loose on shaft due to key becoming loose. This can be told by a rattling inside the pump chamber. The shafts of pumps are liable to corrosion and become weak and sometimes crack, thus making it necessary to fit new ones.

OPERATION OF FEED AND BILGE PUMPS.

On starting a reciprocating pump, the proper suction and discharge valves should first be opened, making sure that when there are two valves in the connection, both are opened.

Open exhaust and cylinder drains and turn steam on slowly to warm cylinder, then open up gradually. If pump fails to start, move valve-gear by hand, observe whether there is an excessive pressure on discharge gauge, if so, a discharge valve may be closed.

If pump starts all right close drains and adjust throttle to suit.

If pump works quickly with a jerky motion the suction may be defective; open pet cock to see whether water is present in suction chamber and ascertain whether there is enough water in tank or bilge to cover end of suction pipe. In some cases it may be necessary to prime pump.

A bilge pump may be primed from the sea, but a feed pump should not be primed from the sea, but from some fresh water tank.

Irregular working may be due to—Shortness of water in tank. High temperature of feed suction and accumulation of vapor in pump. To overcome this difficulty the pump may be cooled by putting it on a cold suction for a short time and trying it again, or by cooling it off with a hose. Sudden change in opening or closing of discharge valves, may be noted by observing the pressure gauge. If pump runs fast without an appreciable discharge the trouble may be due to pump valves being carried away or a leaky piston.

Trouble with valve-gear.—On every vessel general directions as to the operation of the pumps should be obtained from the manufacturers, for there are many special points peculiar to each type. The drawings of valve-gear should be studied so that the operation may be thoroughly understood.

Most difficulties with the valve-gear of pumps are caused by neglect and bad treatment. Generally it is the secondary valve which controls the operation of the main steam valve that becomes stuck or fails to move properly. A few general rules as to care of these parts may be given:

a. Remove valve-gear frequently and clean off all parts, apply a little kerosene and graphite, the graphite for lubrication and the kerosene to remove rust.

b. Do not keep pump standing for any length of time without moving valve, for it may become rusted in places, due to the presence of moisture.

c. Don't keep drains open when not in operation. Open drains allow access of air and thus allow rusting.

d. Do not supply heavy cylinder oil to valve gear in operation since this oil is liable to cake and cause the valve to stick.

e. Keep pump in continuous operation as much as possible. This applies especially to feed pumps which, if kept going continuously, give little trouble, whereas if intermittently stopped and started are not apt to work well.

The chief trouble experienced is caused by rings of rust or burrs being formed on the moving parts. The best way to remove such obstructions is to take the bonnet off and clean the parts.

In pumps having a valve gear operated by tappet motion and distance nuts the valve stem may be too tightly or too loosely packed so as to necessitate too much force, or, on the other hand, allow the valve to drop of its own weight before it should. (This is especially so in Dow pumps, where a tightening up on valve stem stuffing box will often remedy trouble.) The distance nuts may not be properly set for full length of stroke and the cushioning valve may not be properly adjusted.

Lubrication of pump barrel.—The water cylinders of salt water pumps require a certain amount of lubrication for both rods and pump barrel. Feed pumps and bilge pumps generally have sufficient oil in the water they handle to give proper lubrication.

Difficulties experienced with the water end of pumps.—Considerable difficulty is found in properly packing the plunger and in securing reliable packing material. Soft packing for this purpose is generally either square braided, flax or square cotton hydraulic. In packing the plunger, especially with cotton packing, care must be taken that the packing is not put in too tight, since it will swell, and this may take place to such an extent that the plunger will stick. In putting on the packing it is advisable to coat it with graphite.

Hard vegetable packing.—This is made of preparations of rubber, lignum vitae, or paper. These are often used and give reasonable satisfaction; they are supplied in the form of rings, and act in a manner similar to piston rings.

Metallic packing for this purpose consists of brass rings, which often cause excessive wear, and antifriction metal rings, which are more satisfactory, chiefly because they are less likely to wear the surface of the barrel.

Outside-packed plungers are packed with flax packing, and in these pumps special care must be taken to keep the gland free from dirt and grit which would cut the metal of plunger. If plunger becomes cut there is likely to be a considerable loss of fresh water.

Valves of pumps.—Feed pumps use bronze valves with springs and guards. These springs often break and the nuts holding them in place sometimes come loose. In overhauling the pump, special care must be taken to see that these parts are properly secured by split pins and that the springs are set up to the proper ten-

sion. The valve seats are in many cases removable and can be taken out and refaced when they become rough. The valves should always have a smooth bearing surface, and in overhauling the tightness of valve should be tested.

Bilge pumps use rubber valves. In time these valves become soft and begin to decompose; this is generally caused by the action of the oil. Rubber valves may be trimmed and turned, but in most cases they should be removed as soon as they become soft or worn.

ECONOMICAL PERFORMANCES.

On the management of engines in connection with regulation of pressure and the adjustment of cut of of h. p. cylinder depends in a great measure the economy during running.

An increase in the number of expansions will increase the economy. Hence for economy the h. p. cut-offs should be run in, but if anywhere near full power is required and cut-offs are in, a limit to the power of the engine is reached, and if the boiler pressure is at the limit the cut-offs will have to be moved out to obtain the increase of power. To get the greatest power with greatest economy the h. p. cut-off should be run in as far as possible, while at the same time using all steam made by boilers. Where the boiler power is considerably in excess of engine power the cut-offs may be run all the way out and still the boilers will furnish more steam than engine can use. If this is the case the pass-over valves, first the i. p. then the l. p., may be opened and then the limit of power of the engines is reached. There is some question about opening l. p. pass-over since this has the effect of raising the back pressure in l. p. by choking exhaust.

Steam Pressure.—As long as the cut-offs, by being run in, will take care of the steam with throttle wide open, the steam pressure should be at the greatest working pressure. The h. p. cut-off, and not the throttle, should regulate the steam.

In working at reduced powers (below ½ power) conditions become such that steam pressure will drop in h. p. cylinder with cut-off all the way in. Then a lowering of pressure should be resorted to until a point is reached at which the h. p. cut-off will take care of steam, maintaining it at a constant pressure for the desired revolutions. The pressure should, however, not be permitted to go below 80 or 90 pounds for triple-expansion engines in order to make sure that they can be properly handled, so that when the pressure is reduced to this with h. p. cut-off run in, throttling must be resorted to if it is desired to go slower.

It is thus seen that the working pressure should be kept up and throttle open as long as the h. p. cut-off will take care of steam. When the power is further reduced, the boiler pressure may be reduced, keeping h. p. cut-off in. On reaching a boiler pressure of 90 to 120 pounds, throttling should regulate the supply. In this way the initial pressure will be kept up until cut-off takes place. By keeping a high pressure of steam pipe and throttling, the initial pressure is greatly reduced at point of cut-off and the gain in economy due to the high pressure is lost in a large measure though the steam is superheated by throttling, so that something is here regained.

The smooth working of the engines may govern the position of i. p. and l. p. cut-offs; often when they are run into limit the engines do not work well.

Running cut-offs in shortens the travel of valve and is likely to wire-draw the steam through ports, and this should not be carried too far.

ADJUSTING LINKS.

Each cylinder should do an equal share of the work. How matters stand in this respect can be told from working up the indicator diagrams, and also roughly by observing the steam pressure in the receivers, the vacuum, and having in mind the cylinder ratios. The drop in pressure in each cylinder multiplied by its ratio to the h. p. should be nearly equal. Taking an engine whose ratio h. p., i. p., l. p., is 1—2, 5—6; pressure in steam pipe, 160; first receiver, 50; second receiver, 10 pounds; vacuum, 20 inches. The drop in h. p. cylinder is 110 pounds, drop in i. p., 40 pounds, drop in l. p. 20 pounds, $40 \times 2\frac{1}{2} = 100$, $20 \times 6 = 120$. In this case, the power of cylinders is somewhere nearly equal, but l. p. is doing the most work. On account of initial condensation an extra allowance should be given the h. p. If in this case the pressures are changed to 48 for first and 7 for second receivers, a more nearly equal division of work would result. When running at low powers, owing to the drop of initial pressures and wire-drawing, the drop in the h. p. should be considerably more.

The work done by each cylinder can be regulated by adjusting the link. The following rules for adjusting link may be given: 1. Moving h. p. cut-off makes little or no difference in the distribution of the work. 2. By running cut-off in, that is, cutting off earlier, the work of that cylinder is increased and the work of the cylinder above is decreased, since it produces a higher initial pressure in the receiver of the cylinder on which the cut-off was removed and a higher back pressure on the cylinder above it. 3. By running cut-off out the power of that cylinder is decreased while that of the one above is increased. 4. These effects are produced by altering the pressure in the receivers and not by a change in the ratio of expansion. Moving the i. p. and l. p. cut-offs does not affect the ratio of expansion of the engine as a whole.

From the above it will be observed that altering the cut-off of a cylinder will not change the total amount of work done by it and the cylinder next below, while it does affect the individual power of its cylinder and also the one above it.

To give a few practical examples: Suppose it is found that the l. p. is doing most of the work, the h. p. next, and the i. p. least. Move out cut-off of l. p. cylinder. This will decrease the power of that cylinder and increase the power of the i. p. and thus make them both approach to the power of the h. p. If the h. p. is doing most of the work and the i. p. the least, move in the i. p. cut-off. This will decrease the power of h. p. and increase both i. p. and l. p. Now run l. p. cut-off in and the power of l. p. is increased and the i. p. decreased, thus bringing all equal.

The total number of expansions used (neglecting clearance) is found by dividing the decimal of the stroke at which the h. p. cylinder cuts off into the ratio of l. p. to h. p. This with h. p. cut-off = 0.8, Ratio $\frac{\text{l. p.}}{\text{h. p}} = 4$; the number of expansion is 5. If clearance is considered, and to be accurate it should be, the total number of expansions equals

$$\frac{\text{l. p. plus cl}}{K \times \text{h. p. plus ch}}$$

K equals decimal of cut-off of h. p. Whenever the propeller leaves the water the load upon it is removed and the engine will tend to race. When

ch equals clearance of h. p.

cl equals clearance of l. p.

Most four-cylinder triple engines in the U. S. naval service are designed so that the sum of power of two l. p. cylinders equals that of either the h. p. or i. p.

RACING.

Racing of engines is caused by rolling and pitching, heeling, and the action of the waves on the propeller. Whenever the propeller leaves the water the load upon it is removed and the engine will tend to race. When

this happens suddenly there is a danger of breaking something, due to the sudden change of load on the engines. When racing takes place it is safer to reduce the power of the engines, as then the power is limited and there is not as much danger of engine tearing itself to pieces. When racing becomes excessive, throttling will have to be resorted to. Then the machinist will have to stand by the throttle and, by watching the movement of the ship and the engine, must anticipate when the propellers are lifted out and close the throttle to prevent running away, and, as the propeller dips again, to give more steam.

The best indications are the movements of the engine itself. If it slows down and seems to work hard it shows that the propeller is deep in the water and also that it is likely to be lifted out very soon afterwards, so that while the engine is still working hard is the time to start to close the throttle. After a little practice the engines can be so handled by throttling that no sudden changes in revolutions take place.

WAITING.

If engine is required to be ready at immediate notice everything must be kept in readiness, with auxiliaries running slowly. If there is to be about one-half or an hour's notice, steam may be turned off engine.

STOPPING AND WAITING.

For stopping momentarily while maneuvering, the reversing lever is moved to stop and throttle closed, if necessary, with everything ready to move at the next bell. When there is a stop for a longer period, the wicks should be taken out or oil shut off and the air and circulating pumps shut down.

MANAGEMENT OF STEAM.

When stopped or waiting the steam pressure must be looked after. The fireroom must be notified so that fires may be regulated. If pressure rises some auxiliary may be started, such as evaporator, but the bleeder is the direct means of regulating the pressure. The bleeder valves should not be opened suddenly, as the sudden admission of steam is liable to damage the tubes of the condenser. Special precaution should be taken not to allow safety valves to blow, since there is a loss of fresh water, and generally some difficulty about the valve reseating promptly is encountered.

COMING INTO PORT, SHUTTING DOWN.

When the ship is about to come into port all derangements and maladjustments that have been observed should be examined and their character, position, extent, and importance made note of to enable a plan to be made for making repairs. To insure this, each machinist should submit a list of all repairs required in his particular station.

The fires should be allowed to burn down gradually, making sure, however, that there will be sufficient steam for all needs. It is quite important that due notice of arrival in port be obtained so that necessary disposition can be made. All ashes should be hoisted and things prepared for the most important repairs. When engines are done with fires are hauled or banked as ordered.

The oil and water service should be shut off, all wicks taken out, the drains of engines and steam pipes opened, with bleeder to take care of any surplus steam.

Open the drains to free the machinery of water that is being condensed. Boiler-stop valves should be closed and then bulkhead stops, and every measure taken to drain pipes and engines. To this end jackets and separator should be drained. The air and circulating pumps should not be shut down immediately, but allowed to run for about half an hour in order to cool condenser and draw all moisture out of cylinders. When air and circulating pumps are stopped, all valves and sea connections should be properly closed. The drains should then be closed and internal parts of engine kept free from access of air. When main condenser is shut down fresh water side should be pumped out dry

U. S. S. MARYLAND. DAILY AND WEEKLY ROUTINE. ENGINEER DIVISION.

	From "turn to" till twenty minutes to breakfast.	"Turn to" after breakfast (8:15 until noon). Knock off work at 11:30.	After dinner till time for knocking off work of day (this may vary). Until further orders, 4:30.	Evening.
Sunday	Finish cleaning stations. 6 a. m. "turn to."	Prepare for inspection and inspection by commanding officer. (Preliminary inspection by engineer officer.)	Port watch. (Holiday).	Evening inspection and reports. Store rooms secure. Water in tanks. D. B. sounded. Lights out. Bilges pumped. W. T. doors secured.
Monday	5:30 to 6 a. m., wash clothes; 6—7:10 a. m., hoist ashes, move machinery and valves. Detail work and prepare tools. Clean stations.	Muster at stations. Work of day. Drills as per orders.	Work of day.	Ditto.
Tuesday	Ditto.	Ditto.	Ditto.	Ditto.
Wednesday	Ditto.	Ditto.	Half-holiday. Inspection of clothing, small stores, etc., as directed.	Ditto.
Thursday	Ditto.	Ditto.	Work of day.	Ditto.
Friday	Clean bilges, move machinery, etc.	Muster at stations. Finish bilges and work of day.	Instruction drills, boats, etc. Inspect and test mechanical devices, compartments, etc.	Ditto.
Saturday	Clean stations, move machinery, etc.	Muster at stations. Clean stations; clean out wash rooms for Sunday inspection.	Half-holiday.	Ditto.

MODIFICATIONS.—Section having 12 to 4 a. m. (mid watch) is aux. watch off for day succeeding. This section will have liberty after working hours on liberty days.

to prevent water going into engines.

In coming into port various dispositions must be made of auxiliary steam and exhaust. If exhaust is on l. p. receiver it must be turned into condenser before engine is stopped. The auxiliary stop, if fitted, on all boilers not to be kept under steam must be closed. The auxiliary stops of boilers to be kept in use must be open.

Oil cups, pipes, and drip pans should be cleaned at once, using hot water and lye to remove oil. All grease and oil should be cleaned off engines before engines cool and deposit becomes hard. A great deal of dirt can be washed off by using fresh water hose.

After this crank pits should be cleaned out and bright work attended to. Gaskets and other coverings should be put over ends of bearings and other parts to prevent dirt from dropping in. The stern gland should be tightened up to stop too much water coming in.

The machinery should be put in best position to make the desired repairs, and tools and material got ready for overhauling.

ROUTINE UNDERWAY.

The routine of engine watch underway should be as indicated in a routine table kept on board ship. A sample is here given.

The watches are relieved just before eight bells, it being the general practice to have all the new watch on when eight bells strike. On relieving, all orders should be passed along on each station, and a general statement of how everything is working should be given.

After relieving, a general inspection of everything should be made and defects adjusted.

The machinist in charge of watch should read over the logs of the previous watches to see how matters have been going and whether any new disposition is to be made.

On some ships a condition blank, as per sample, is kept and turned over by the machinist of the watch.

The log data should always be carefully taken, and if it is not possible to be accurately taken, should be left out or noted as such, for misleading or inaccurate data are worse than none.

The hotwell water should be frequently tasted so that it may be immediately known when it becomes salty and way by which salt has come in looked for. In addition to tasting the feed water the silver nitrate test may be applied from time to time.

The periodical oiling and feeling of bearings must be kept up, and the round of all the auxiliaries frequently made.

Bilges should be pumped and strainers cleaned during fourth hour so that the new watch may come on with bilges in good shape.

The double-bottoms should be sounded each day at a special time, generally 6 to 8 p. m. watch.

During the time on watch spare time should be used in keeping engine room clean. If this continual cleaning is kept up on the run, there will not be so much work when coming into port, and if an engine room is never allowed to get dirty it is more easily kept in good condition.

ACCIDENTS UNDERWAY.

The best prevention for accidents underway is to have everything in proper shape and adjustment so that defects are not likely to develop.

An occasional defect is a great teacher, and the sea experience gained on an old, broken-down installation is perhaps the most valuable that could be obtained. When nothing ever breaks, the attendants are not likely to be very familiar with ways of repairing.

Besides the points enumerated under running of engines, the following are among the accidents most likely to occur. With the great improvements in design tending to reliability and freedom from accidents, some of these may very seldom occur.

HOT PISTON ROD.

Hot piston rods are caused by packing being set up too tight, by being out of line, by grit in stuffing box, or insufficient lubrication of the rod.

A hot rod is told by the smell of burning oil and by the fact that the engine appears to work hard, or a thump may develop.

If the rod is quite warm, water or oil applied with a syringe will hiss and run off in little globules (spherical condition), and if very hot, oil will cause a dense smoke.

A hot piston rod is very serious, as there is danger of the rod bending.

If rod is only warm, it may be relieved by slacking back on stuffing-box gland and applying oil liberally and reducing the speed of engines.

If rod is hot, the engines should be slowed down to reduce load on piston. The gland must be slackened up to reduce friction. Then oil should be applied with a brush, swabbing all sides of rod so that the different portions may be cooled down at the same time. Water should not be put on a hot rod, as it is liable to cool it too suddenly and cause the rod to bend.

With approved kinds of metallic packing, there is not much danger of rods heating. When, however, rods are packed with soft packing and an ordinary gland there may be danger. One of the causes for this is an unequal setting up on packing, whereby one side is too tight and presses hard against the rod.

The packing should not be ragged or too hard, and above all, lubrication must be provided in the packing and also by swabbing rods. There are cases where soft packing (Selden's) has actually caught on fire and caused considerable blaze in the engine room.

One of the principal causes of a piston rod heating is that the piston is thrown out of line with the crosshead

Date ____________

U. S. S. MARYLAND. ENGINEER DEPARTMENT.

CONDITION BLANK.

To be kept in engine room and passed over to relief by engineer of the watch and machinist on watch in port.

Watch							
Boilers banked							
Boilers steaming							
Coal from bunkers							
Reserve feed from							
Leak in boilers							
Coal allowance							
Steam pressure							
Revolutions							
Evaporators							
Ice machine							
Steering engine							
Dynamos							
Dynamo condenser							
Heaters							
Pantry circuits							
Bath heaters							
Auxiliary exhaust on							
Pumps, feed in use							
Pumps, fire and bilge							
Heated bearings							

Extra work going on — Engine room. Fire room.

Officers on duty

Machinist of Watch.

slide, in other words, the packing in stuffing box becomes a guide, something it should not be. At top of stroke the entering steam throws the piston against the cylinder and thus throws piston out of line. If the edge of groove in piston becomes burred, the rings will not come to the center again, and thus the piston runs out of line and the rod gets hot.

VALVE RODS.

Valve rods, especially when they pass through guide bushings, sometimes heat and stick, due chiefly to improper lubrication or grit getting on to wearing surface. The remedy is to cool the parts by a good supply of oil, and, if possible, loosen up on guide.

HOT CONDENSER.

This, of course, will be noticed by a fall in vacuum, and may be caused by a variety of things, the principal thing, a lack of circulating water. When a condenser has become hot due to lack of circulating water, the engine should be stopped and all exhaust turned off the condenser. Otherwise the condenser will get hotter and burn out the packing in glands. The air pump should be continued on the condenser. If the air pump is attached to engine, the feed pump should be put on channel ways to take water out of condenser. If there is any engine-room pump by which water can be put into the condenser and opening the salt drain, a slight circulation can be set up. Usually the water-service pump has some sort of a connection by which this can be done. If there are any connections by which another supply of circulating water can be obtained and condenser thus cooled, the engines may continue to run, but unless this can be done they must be stopped until condenser is again in working order.

The following are some of the different things that may happen to prevent a supply of circulating water: 1. Injection or discharge valves not opened or stopped up. Sometimes the injection valve may work loose from its stem and remain closed, in which case divers must be sent down to plug opening and then valve may be taken out and repaired. The strainer, if stopped up, will have to be cleared in some way. 2. Runner of circulating pump getting loose from shaft. This may happen if key gets loose. 3. Shaft of circulating pump breaking due to corrosion. In these two cases, the pump engines will run without a load. 4. The stopping of pump engine.

LEAKS.

Leakage of steam and fresh water is a matter that should be very carefully looked after; a steam leak not only means the waste of so much fresh water, but also a loss of heat. Small steam leaks may not appear to have very great importance, but when it is considered that there are hundreds of them and that every particle counts, some idea of what it may amount to can be gathered.

To state roughly, it requires about four tons of extra feed per 1,000 H. P. per 24 hours. If more than this is used the cause should be located and leakage stopped.

Leakage is reduced by keeping all joints tight, especially in piping and boilers, by keeping valve spindles properly packed, by keeping valves tight, and by properly packing all stuffing boxes.

AIR PUMP FLOODED.

The air pump may become flooded from a variety of causes. The discharge opening may become obstructed and the water may then not be able to flow away quickly enough. The suction may be suddenly opened and then too much water will come to the pump.

The flooding of the pump will make itself known by heavy thumps and a fall in vacuum. With attached air pump, it would be well to slow down until pump has freed itself of the overhead of water, otherwise there is danger of the bonnet of air pump being broken. With independent air pumps there is less likelihood of pump becoming flooded.

BREAKAGES.

Fractures in cylinders, pistons, piston rods, crossheads, and connecting rods are caused by: 1. Water in cylinders. 2. The slacking back of nuts on piston or follower. 3. A dropping down of piston so that the piston strikes at one end. 4. Obstructions such as tools or material left in cylinder. Aside from fractures caused by priming, the causes above are due to lack of care when engines are overhauled or adjusted, and will thus be seen that it is of extreme importance to see that all parts, especially nuts, are properly secured and that no obstructions are left in the cylinders. Nuts, bolts, wrenches, and the like have sometimes been left in cylinders without causing accident. At other times they have been pressed into the metal of piston and in other cases ground into small bits. The causes and treatment of priming have been discussed under operation of engines.

DISCONNECTING CYLINDERS.

In cases where some of the working parts enumerated above are broken so that they cannot be repaired or spares fitted, it may be necessary to disconnect one cylinder and run with the remaining ones.

Where none of the auxiliaries, such as air and circulating pumps are operated from the main engines, any one of the cylinders may be disconnected by taking out or securing its connecting rod, securing piston in place, and taking out the valve for that cylinder. In such cases the steam will pass directly from the admission to the exhaust ports and into the next receiver or condenser, as the case may be. In order to prevent loss of steam in the disconnected cylinder by radiation and condensation, the admission ports for that cylinder should be blocked up. Soft wood or melted lead or babbitt may be used for this purpose.

The valve gear in these cases must, of course, be disconnected, the stuffing box for valve stem blanked off and cylinder closed.

ADJUSTING PRESSURES.

A triple-expansion engine can run as a compound with any two cylinders. The cut-off and pressure should, however, be adjusted to suit each cylinder. If the h. p. cylinder is cut out, the boiler pressure should be reduced to the pressure of safety valve on i. p. receiver, or steam must be throttled a suitable amount. If i. p. is cut out a greater range of expansion should be used in the h. p. and the cut-off of l. p. run out so that the pressure of l. p. piston will be the same as before.

PUMPS OPERATED FROM BROKEN CYLINDERS.

When this is the case it is necessary to keep these auxiliaries in operation. If the cylinder and piston are intact and the connecting rod or piston rod broken, these parts may be taken from one of the other cylinders and thus the cylinder kept in operation. If the connecting rods are intact and it is the piston or cylinder that is broken; the cylinder should be disconnected, broken parts removed and piston rod allowed to work through stuffing box as a guide, the pump rods, etc., working from crosshead as before.

ROD BROKEN OR BENT.

If the piston rod is broken or bent it should be disconnected to allow the connecting rod and crosshead to drive the pumps.

RUNNING ENGINE SINGLE CYLINDER.

When it becomes necessary to run an engine with a single cylinder there may be some difficulty at starting to bring her over the center. In order

to help matters along, shift valve or eccentric so that you have a big lead on bottom and small cushioning. The weight will then tend to drive her over the top center and the big lead at bottom will give steam to drive her up.

BROKEN CYLINDER HEADS OR CASTINGS.

Where cylinder heads or castings are broken beyond repair they must be disconnected and the ports leading to it blocked up and valve taken out.

BLOCKING PORTS.

For blocking up ports or filling up small holes in a cover or any other part of cylinder where there is no great stress and where the pressure is not great as i. p. and l. p. cylinders, melted lead or babbitt poured into such holes makes a very satisfactory and easily made patch. Where great pressures come upon the blocking, measures will have to be taken to strengthen it sufficiently.

REPAIRING BROKEN HEADS.

Broken heads can usually be repaired in some way.

Heads cracked.—This may generally be repaired by putting a plate on top and securing it by set screws, and, in order to make it steam tight, imbedding it in putty made of red lead, hemp, and asbestos, or other suitable material. Some sort of plate can generally be found on board, and. if necessary, a door or some other fitting made of plate may be utilized. Patches over broken cylinder covers are often secured by shoring from the deck above.

Head completely broken.—When the head is completely broken up a wooden one may be made, strengthened by plates or iron ribs, and placing several courses of sheet packing under it to insure steam tightness. In such cases shoring from above would be advisable. In order to avoid unnecessary shoring, etc., the pressure that is to come upon the cylinder should always be taken into consideration.

BROKEN CYLINDER BOTTOM.

This is, in general, a more difficult job to repair since there is no good opportunity for shoring or securing. In this case it may be advisable to put a patch on the inside by any means available. Then put liners under piston rod to raise it and a distance piece under cylinder cover. To make such repaired joints tight melted babbitt will be very useful.

BROKEN PISTON.

If the piston is not broken into many or small pieces it may be repaired as described by Mr. A. R. Leask (in "Breakdowns at Sea"). In this case a ring of diameter nearly equal to diameter of piston is made and shrunk on the body of piston. The height of this ring should be equal to the difference between the height of piston hub and piston at point where ring is shrunk on. A circular plate is then taken of diameter equal to ring, a hole cut out to fit hub snugly, and ring laid on. Drill several rows of holes into this plate and corresponding tap holes in piston; then tap in iron rods through holes in plate into piston, cutting off ends and riveting them over plate, or put nuts on top of plate.

The plate should preferably be in one piece, but, if necessary, several may be taken, care being had that the joints do not come over the break in piston.

BROKEN RODS.

Broken rods may be repaired by using the dovetail key. The broken parts are put together and a dovetail is marked thereon, making it about ½ in. larger on one side so as to form a draw or taper for the key. The dovetail is then cut out and cleaned carefully, a corresponding dovetail key made and driven home, and riveted over into countersink at smaller end, if necessary, to prevent working back. The key can then be smoothed off, and, if necessary, can work through a stuffing box. By this means the rod can be made nearly one-half the original strength.

Fishes and Clamps.—In addition to the dovetail key, where a strong support is desired, fishes and clamps may be used.

Here a bar is placed on either side of the broken rod and strong-bolted clamps made and bolted up. The number of clamps and length of bar will, of course, always depend upon circumstances. The bars should be placed over the key to prevent it coming out, and on fitting key the direction of the strain brought upon the rod should be considered. In eccentric and connecting rods this strain is athwartship.

BROKEN CRANK PINS.

A break in the shaft may occur at the fillets or at fracture. The best way to repair such a fracture would be to bore a hole through crank pin and webs and insert a pin to fit tightly into the hole. The size of such pin should be about three-fourths the diameter of the crank pin, provided the area of pin does not exceed one-third area of web.

To bore the hole, first use an ordinary drill, then rig a boring bar and take successive cut; as the hole increases use a larger boring bar and stronger tools. A wooden bush to prevent bar getting out of line will be useful. The pin, being prepared to fit the hole closely, should be driven in hard and the ends riveted over.

If anything like full power is desired, the repaired crank should be shifted to the forward cylinder, since the after crank has to stand the twisting movement of the whole engine while the forward has only that due to one cylinder.

The original surface of crank pin must be retained to give the bearing surface, in case this is broken out or rough it may be smoothed up with white metal and then scraped.

BROKEN CRANK WEB.

Crank shafts may break at webs. The repair for this is to put a strap around the web. The size of strap should be such that the area of section of strap is about one-quarter area section of web. The strap should be forged to shape, the holes bored for bolt, and then should be put on hot, tightened up, and allowed to cool. The strap will then firmly grip the web.

SHAFTS.

A fracture may take place at thrust collar, and an example of a repair of this nature is given.

Generally this may be repaired by fitting a clamp around the shaft to keep the parts together and fitting bolts with distance pieces between the collars.

Bolts or some other means of bringing the two parts together tightly must be provided.

When the break extends over several collars, long bolts must be used. It is also better to use a larger number of small bolts than a few large ones.

A break in the line shafting is harder to repair. Means must be provided, first for bringing the two parts together, and then material for taking the twisting movement.

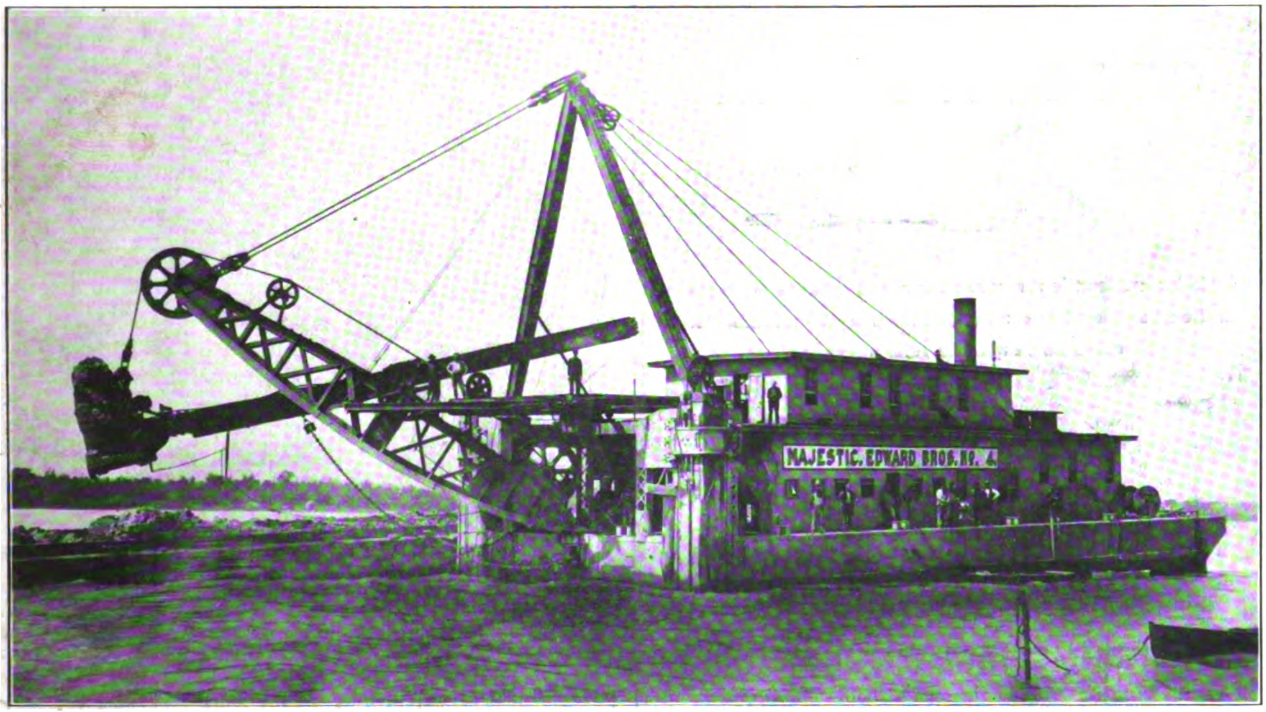
The dovetail keys keep the parts of shaft together, and the clamps bind the keys close to the shaft. To fit clamp so that they come up real tight, the bolts should be put on hot and nuts set up; as they cool the bolts will contract and grip the shaft securely.

A shaft broken at a coupling is a more serious repair. The angle plates are cut out so as to fit exactly between the bolt heads and the other edges into a recess cut into shaft. The angle plates are fitted and secured in place by set screws. A stout clamp should be fitted around all of them to keep them securely in place.

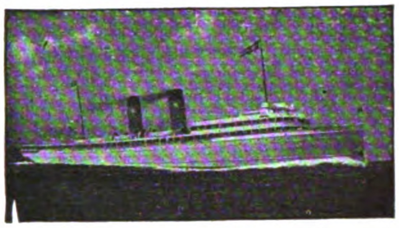
10c. a Copy **ENGINEERS' NUMBER** $1.00 a Year

THE MARINE REVIEW

VOL. XXXIV. CLEVELAND, OCTOBER 4, 1906. NO. 14.



Dredge "Majestic" built for Edward Bros., 1906.



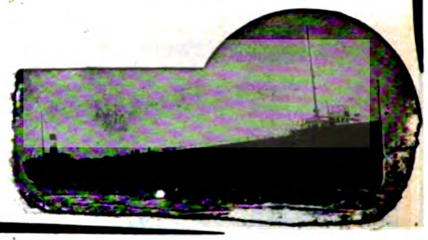
The American Ship Building Company

MAIN OFFICE CLEVELAND, OHIO

Marine and Stationary Engines **STEEL SHIPS** Boilers and Auxiliary Machinery

Sole Agents for the Lakes for the Ellis & Eaves Induced Draft System, as applied to boilers, giving increased power and great economy.

WORKS AT CLEVELAND AND LORAIN.



Detroit Ship Building Company

SHIP AND ENGINE BUILDERS

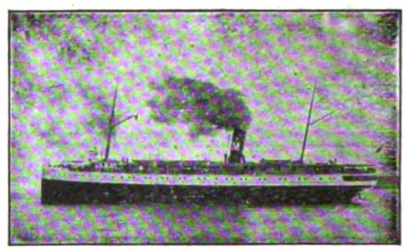
Sole Owners for the Lakes and Atlantic Coast of the HOWDEN HOT DRAFT SYSTEM as applied to Boilers, giving increased power and great economy.

Steel Ship Yard located at Wyandotte, Michigan Wooden Ship Yards and Dry Docks, Foot of Orleans Street, and Foot of Clark Ave., Detroit, Mich.

Wm. C. McMillan, President.
M. E. Farr, V. P. and Treas.
E. Ketcham, Secretary.
Frank Jeffrey, General Supt.

WM. L. BROWN, Pres.
J. C. WALLACE, Vice-Pres.
R. C. WETMORE, Sec'y and Treas.
C. W. FREY, Ass't. Treas.
ALFRED G. SMITH, Gen'l Supt.

Chicago Ship Building Company



STEEL SHIPS

Passenger or Freight

ANY SIZE

Yards, Dry Docks and Repair Shops at South Chicago, Ill.

The Superior Ship Building Company

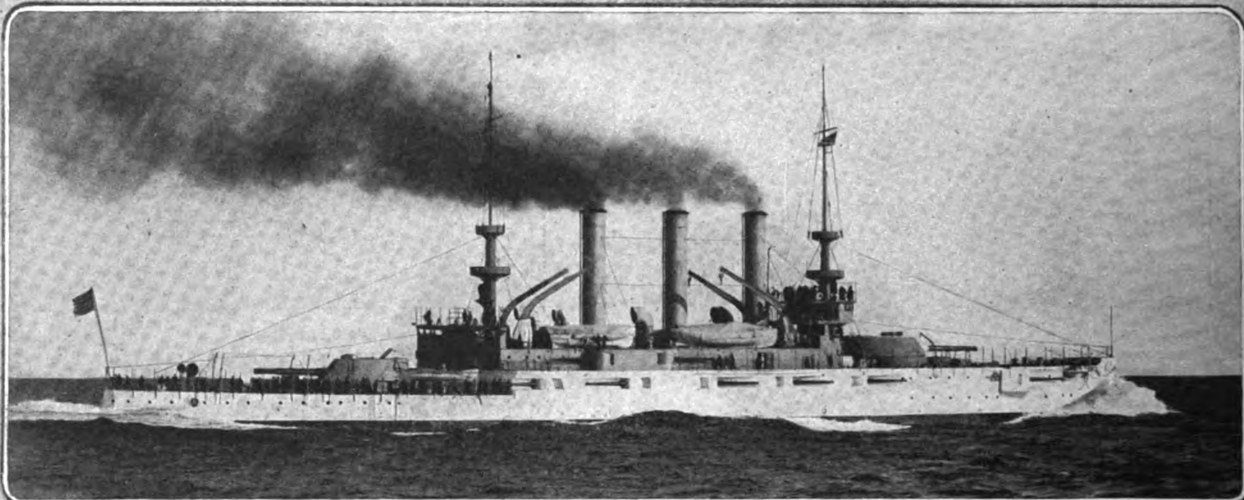
SHIP AND ENGINE BUILDERS

Dry Docks and Repairs of all kinds

WEST SUPERIOR WISCONSIN

Large stock of material always on hand for Repairing Wooden and Metal Ships.

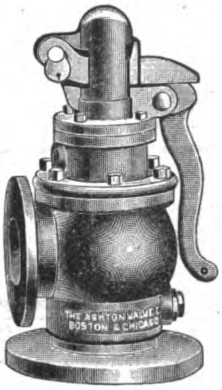
Repairing promptly attended to, Night or Day.



Ashton Highest Grade

Pop Safety Valves and Steam Gages

Guaranteed to give
Unequalled Efficiency, Durability and Perfect Satisfaction.



Special Features in valves.

Outside Pop Regulation.

Cam Lever Attachment.

Jessops Steel Spring.

Gages have Non-Corrosive Movements.

Accurately Graduated Dials.

Seamless Drawn Springs.

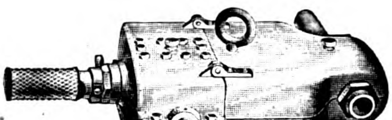
Specify the Ashton and Get the Best.

THE ASHTON VALVE COMPANY.

271 Franklin St. - BOSTON, MASS.

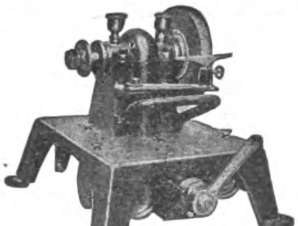
Branches: New York. Chicago. Philadelphia. San Francisco.

HELWIG
Reversible Pneumatic Motor



for drilling, tapping, reaming and expanding flues. With it you can drill close to corner or wall and in confined places. It has hinged cover readily raised for oiling and inspection.

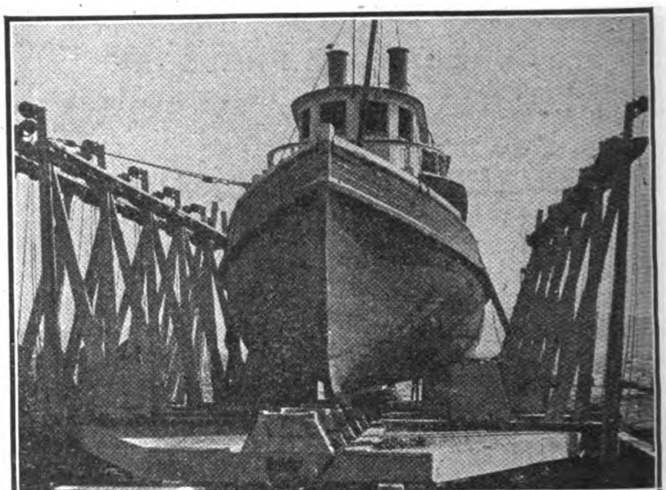
Portable Pneumatic Grinder



Equipped with emery wheel, weighs 50 lbs., can be carried to place most convenient to work, avoiding necessity of going to stationary grinder.

Send for Catalogue

HELWIG MFG. CO.
St. Paul, Minn.



RAILWAY DRY DOCKS

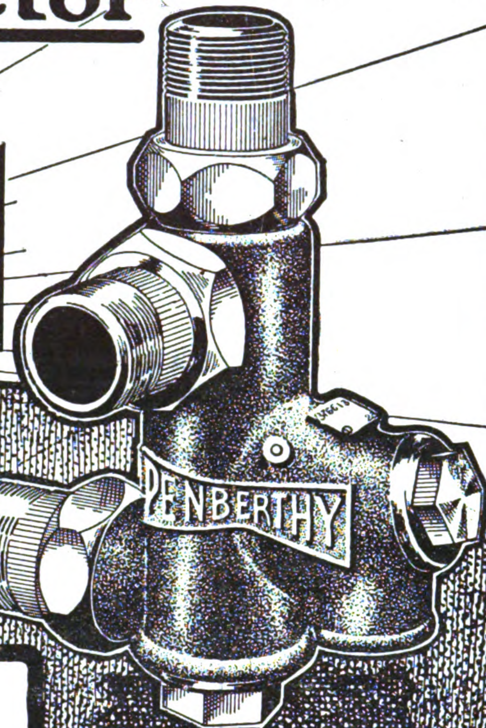
STEEL AND TIMBER CONSTRUCTION

Safe, Rapid, Convenient, Reliable, Economical

H. I. Crandall & Son Co.
Engineers and Contractors
East Boston Mass.

The Sun Never Sets on the Penberthy Injector

TRADE PENBERTHY MARK



Send for Catalog of

INJECTORS, OILERS, ETC.

PENBERTHY INJECTOR CO.

Branch: N. Y. City. Detroit, Mich.

LUNKENHEIMER GREASE CUPS

Will prolong the life of bearings and prevent them from getting hot.

Made in great variety with and without automatic feed.

Strong, Practical and Durable.

If your local dealer cannot furnish them notify us,

The Lunkenheimer Company.

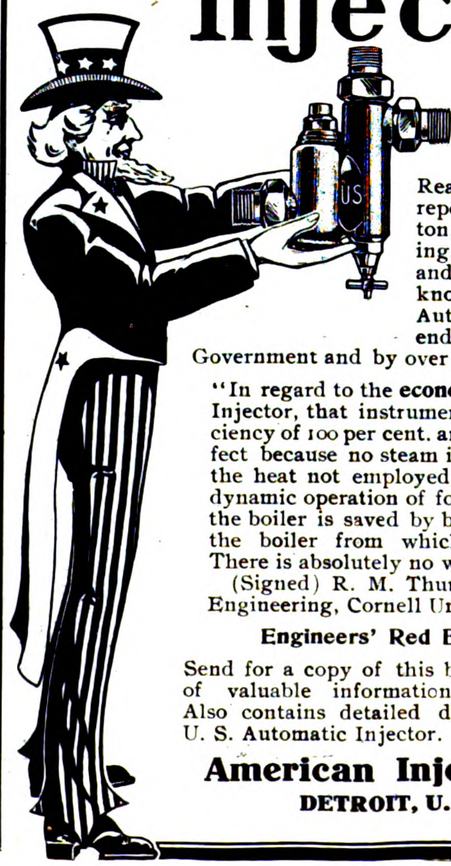
LARGEST MANUFACTURERS OF HIGH-GRADE ENGINEERING SPECIALTIES IN THE WORLD.

We also manufacture a complete line of Iron and Brass Valves, Whistles, Cocks, Injectors, Oil and Grease Cups, Water Columns, Mechanical and Hydrostatic Lubricators, etc.

Branches: NEW YORK, 66-68 FULTON ST. LONDON, S. E., 35 GREAT DOVER ST.

2 M R.

U.S. Automatic Injector



100% Efficiency

Read this condensed report by R. M. Thurston, Prof. Engineering, Cornell University and then you will know why the U. S. Automatic Injector is endorsed by the U. S. Government and by over 200,000 engineers.

"In regard to the **economy** of the U. S. Injector, that instrument shows an efficiency of 100 per cent. and is ideally perfect because no steam is wasted and all the heat not employed in the thermodynamic operation of forcing water into the boiler is saved by being returned to the boiler from which it is issued. There is absolutely no waste. . . ."

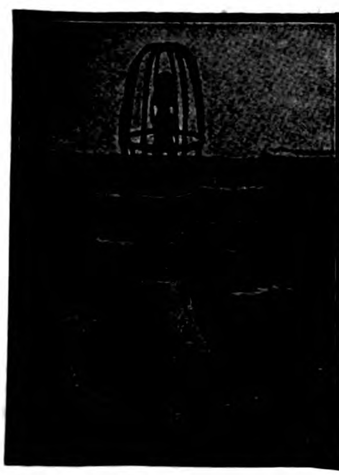
(Signed) R. M. Thurston, Professor Engineering, Cornell University.

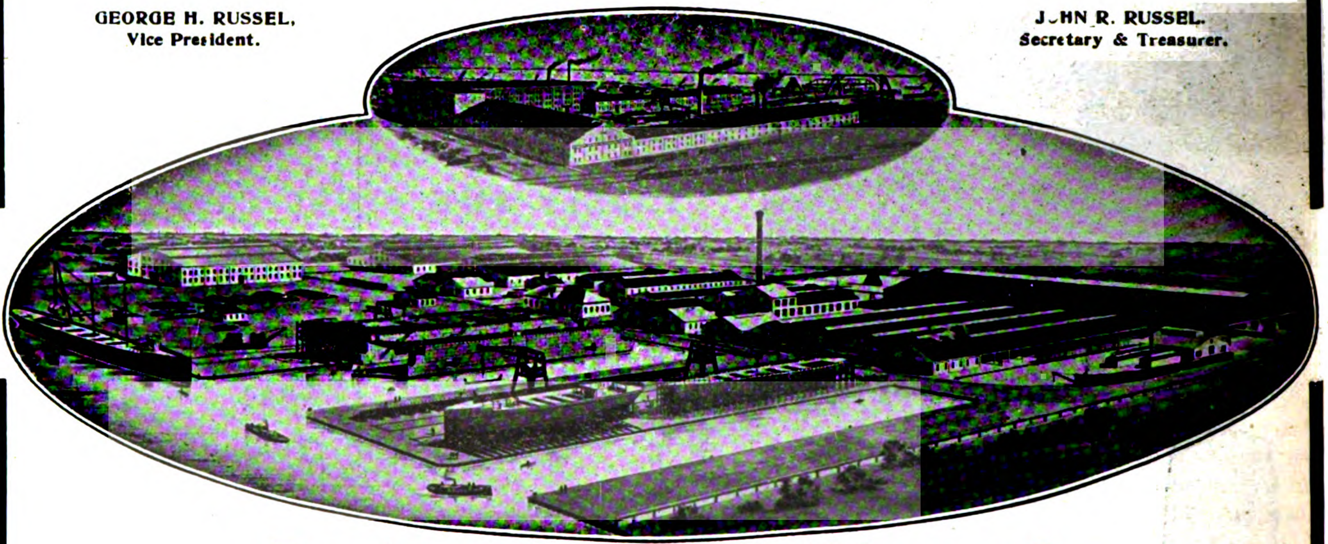
Engineers' Red Book Free.

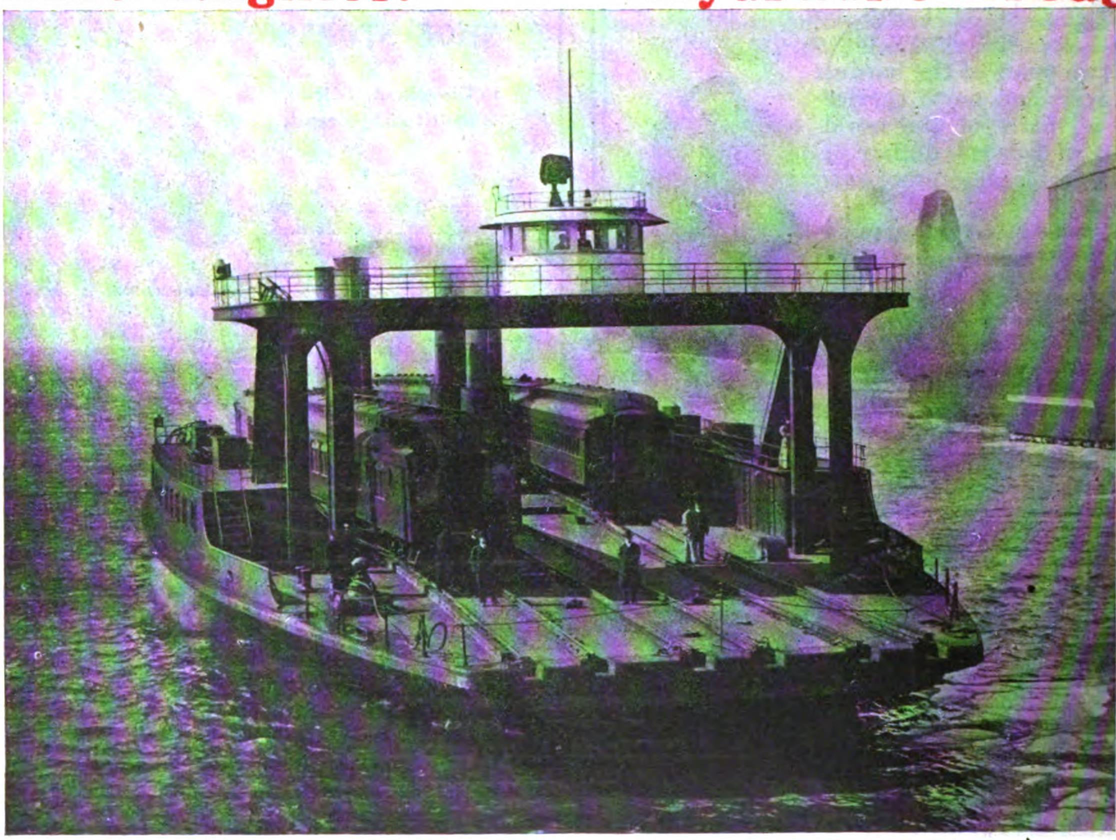
Send for a copy of this brief compendium of valuable information for engineers. Also contains detailed description of the U. S. Automatic Injector.

American Injector Co.,
DETROIT, U. S. A.


8' x 12' FLOAT—45 PERSONS—450 CUBIC BOAT FEET







WANTED and FOR SALE

PROPOSALS.

U. S. Engineer Office, Jones Building, Detroit, Mich., October 2, 1906. Sealed proposals for hire of dredging plant for use in St. Mary's River, Michigan, will be received at this office until 2 p. m., Oct. 22, 1906, and then publicly opened. Information furnished on application. Chas. E. L. B. Davis, Col., Engrs.

FOR SALE.

Steamer T. S. Christie.

Length 160 ft.; beam 30 ft.; carrying capacity, lumber 525,000 ft., coal 800 tons. Rating in Inland Lloyds Register, A1½*, valuation $22,000. For price and particulars address Capt. P. Larsen, Box 249, Chicago, Ill.

For Sale, Tug Gladiator.

Length, 115 ft.; breadth, 22 ft.; depth, 12 ft. Steeple compound engine 22 x 42 x 30. Housed in forward. Tug can be seen under working conditions at Duluth, Minn., by applying to Split Rock Lumber Co., Duluth, Minn.

Steamer for Sale Cheap.

The lighthouse steamer Haze, 145 ft. long, 27-ft. beam, 9-ft. draught, 500 tons capacity, 300 horsepower engine and boiler, suitable for passenger or freight business, fully equipped. Steam capstan, donkey boiler. Jacob Ullman, 46 Lloyd street, Buffalo, N. Y.

For Sale.

1,000 h. p. fore and aft Neafie & Levy compound Engine; surface condenser; independent pumps.

Two 12-foot Scotch Boilers.

One 13½-foot Scotch Boiler.

One 10 16-25 x 16 triple expansion Engine.

Three 150-h. p. Almy Boilers.

One 200-h. p. Tregurtha Boiler.

One 14 30 x 24 fore and aft Engine and condenser.

One Williamson steering Engine.

One 10 k. w. electric lighting Set.

One 15 k. w. electric lighting Set.

One Providence Windlass, 50 fathoms 1½ in. chain.

Two thrust Shafts and Bearings, 8½ in. diameter.

MARVIN BRIGGS,

17 Battery place, New York, N. Y.

Boilers for Sale.

Five Scotch Boilers, allowed 160 lbs, steam. Good as new. ERIE MACHINERY CO., 729 Garfield Bldg, Cleveland, O.

Will Sell Cheap.

One large Queen City steam steering gear, complete; one large steam windlass, cylinders 9 x 9, made by Bath Iron Works; two very heavy iron timber heads. Outfit originally cost $2,700; will sell for $600. Address 8381 Detroit Ave., W. D. Metcalf, Cleveland.

FOR SALE OR TRADE.

Steamer Fannie C. Hart, a freight and passenger steamer, 476 gross tons, 143 ft. length, 30 ft. depth. Has sleeping accommodations for 70 people. Allowed 500 excursionists.

FOR SALE OR TRADE.

Steamer Eugene C. Hart, a freight and passenger steamer, 522 gross tons, 152 ft. length, 25 ft. beam, 9 ft. depth. Will sleep 80 people. Both fore and aft compound engines. Green Bay Transportation Co., Green Bay, Wis.

THAT'S OUR BUSINESS

Buying, Selling, Chartering BOATS.

If you desire to charter, sell or buy let us help you.

CHICAGO STEAMER EXCHANGE,

No. 144 So. Water Street,

Long Distance Phone Cent. 5046. **CHICAGO.**

GREAT LAKES REGISTER

FOR THE CLASSIFICATION OF STEEL AND WOODEN VESSELS.

Estb. 1828 — BUREAU VERITAS REGISTRE FONDE 1828 — GREAT LAKES REGISTER ESTD. 1896 — Estb. 1896

COMBINED AND ISSUED IN CONNECTION WITH

BUREAU VERITAS

INTERNATIONAL REGISTER OF SHIPPING.

THE RATINGS OF GREAT LAKES REGISTER GO BEFORE AND ARE ACCEPTED BY THE LEADING UNDERWRITERS OF AMERICA AND EUROPE. VESSELS BUILT UNDER THE SUPERVISION OF ITS SURVEYORS WILL RECEIVE SPECIAL RATING, AND WILL ALSO BE PUBLISHED IN BUREAU VERITAS INTERNATIONAL REGISTER OF SHIPPING.

PLANS AND SPECIFICATIONS FURNISHED.

GREAT LAKES REGISTER SURVEYORS ARE ESTABLISHED AT ALL THE PRINCIPAL PORTS ON THE GREAT LAKES.

F. D. HERRIMAN, SURVEYOR GENERAL,

320-322 Perry-Payne Building, - - - CLEVELAND, O.

CHARLES E. PECK. WILLIAM A. PRIME.

CHAS. E. & W. F. PECK

Insurance Brokers. Average Adjusters.

ESTABLISHED 1870.

NEW YORK, 58 William Street,
BOSTON, 153 Milk St.
BUFFALO, 914 The Fidelity Bldg.
CLEVELAND, 1006-1008 Rockefeller Bldg.
CHICAGO, 1114-15 Royal Insurance Bldg.

REPRESENTED BY

C. T. BOWRING & CO., (Insurance) LTD.,

5 and 6 Billiter Ave., LONDON,
and at "LLOYD'S" LONDON.

HULLS AND CARGOES.

We place insurances in the most advantageous markets, employing, in the interest of our clients and with equal facility, all Foreign and Home companies, at the best procurable rates and terms.

We Represent Only the Assured.

Atlantic Mutual Insurance Company

Atlantic Building, 51 Wall Street, New York

Insures against marine and inland transportation risk and will issue policies making loss payable in Europe and Oriental countries.

Chartered by the State of New York in 1842, was preceded by a stock company of a similar name. The latter company was liquidated and part of its capital, to the extent of $100,000, was used, with consent of the stockholders, by the Atlantic Mutual Insurance Company and repaid, with a bonus and interest, at the expiration of two years.

During its existence the company has insured property to the value of - - - - - -	$21,108,343,494.00
Received premiums thereon to the extent of - -	224,197,211.06
Paid losses during that period - - - - - -	127,760,071.08
Issued certificates of profits to dealers - - -	81,310,840.00
Of which there have been redeemed - - - -	73,744,440.00
Leaving outstanding at present time - - - -	7,566,400.00
Interest paid on certificates amounts to - - -	19,469,981.85
On Dec. 31, 1905, the assets of the company amounted to	12,716,427.62

The profits of the company revert to the assured and are divided annually upon the premiums terminated during the year, thereby reducing the cost of insurance.

For such dividends, certificates are issued subject to dividends of interest until ordered to be redeemed, in accordance with the charter.

ANTON A. RAVEN, Pres. THEO. P. JOHNSON, 2nd Vice-Pres.
CORNELIUS ELDERT, Vice-Pres. JAS. L. LIVINGSTON, 3rd Vice-Pres.
G. STANTON FLOYD-JONES, Secretary.

BUYERS' DIRECTORY OF THE MARINE TRADE.

For a more complete classification than that represented by advertisers in The Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, Marine and Naval Directory of the United States, published by The Marine Review, Cleveland.

[See accompanying Index of Advertisers for full addresses of concerns in this Directory.]

AIR COMPRESSION, HOISTS.
Great Lakes Engineering Works.... ....Detroit.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co......... .... New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co...... .... Quincy, Mass.
Great Lakes Engineering Works.... .... Detroit.

ANCHORS.
Bowers, L. M. & Co................ ....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co........ .... Cleveland.
Detroit Ship Building Co....Detroit.
Great Lakes Engineering Works.... .... Detroit.

ASH EJECTORS.
Great Lakes Engineering Works.... .... Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J........Cleveland.
Goulder, Holding & Masten........ .... Cleveland.
Hoyt, Dustin & Kelley....Cleveland.
Jenkins, Russell & Eichelberger.... ....Cleveland.
Kremer, C. E. ....Chicago.
MacDonald, Ray G.........Chicago.
Shaw, Warren, Cady & Oakes...... .... Detroit.
White, Johnson, McCaslin & Cannon ....Cleveland.

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.............. ....Brookline, Mass.

BLOCKS, SHEAVES, ETC.
Boston Lockport Block Co........ ....Boston, Mass.

BLOWERS.
American Blower Co., Detroit, Mich.

BOAT BUILDERS.
Drein, Thos. & Son................ ....Wilmington, Del.
Kahnweiler's Sons, David.......... ....New York.
Marine Construction & D. D. Co.. ....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.............. ....St. Joseph, Mich.

BOILER COMPOUNDS.
The Bird-Archer Co......New York
Dearborn Drug & Chemical Works.. ....Chicago.
Lake Erie Boiler Compound Co........ ....Buffalo
State Manufacturing Co...Cleveland.

BOILER MANUFACTURERS.
Almy Water Tube Boiler Co........ ....Providence, R. I.
American Ship Building Co......... .... Cleveland.
Atlantic Works..East Boston, Mass.
Briggs, Marvin..........New York.
Chicago Ship Building Co..Chicago.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co....Detroit.
East End Boiler Works....Detroit.
Fletcher, W. A. & Co.............. ....Hoboken, N. J.
Fore River Shipbuilding Co........ ....Quincy, Mass.
Great Lakes Engineering Works.... .... Detroit.
Kingston Foundry & Machine Works ....Oswego, N. Y.
Lake Erie Boiler Wks........Buffalo
Maryland Steel Co.................. ....Sparrow's Point, Md.
Milwaukee Dry Dock Co.......... ....Milwaukee.
Mosher Water Tube Co..New York.
Newport News Ship Building Co.. ....Newport News, Va.
New York Shipbuilding Co.......... .... Camden, N. J.
Northwestern Steam Boiler & Mfg. Co............ ....Duluth, Minn.
Quintard Iron Works Co.......... ....New York.
Roberts Safety Water Tube Boiler Co. ....New York.
Superior Ship Building Co........ .... Superior, Wis.
Taylor Water Tube Boiler Co.... .... Detroit.
Toledo Ship Building Co.......Toledo.

BOILER RIVETS.
Bourne-Fuller Co.........Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.......... ....Cuyahoga Falls, O.

BRASS AND BRONZE CASTINGS.
Cramp, Wm. & Sons....Philidelphia.
Fore River Ship & Engine Co...... ....Quincy, Mass.
Great Lakes Engineering Works.. .... Detroit.
Lunkenheimer Co........Cincinnati.

BRIDGES, BUILDERS OF.
Scherzer Rolling Lift Bridge Co.... ....Chicago.

BUCKETS, ORE AND COAL.
Brown Hoisting & Conveying Machine Co............... Cleveland.
G. H. Williams Co........Cleveland.

CABIN AND CABINET FINISHING WOODS.
Martin-Barriss Co........Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.........Buffalo.
Bunker, E. A..........New York.
Upson-Walton Co.........Cleveland.

CAPSTANS.
American Ship Windlass Co........ .... Providence, R. I.
Dake Engine Co.................... ....Grand Haven, Mich.
Hyde Windlass Co.........Bath, Me.
Marine Mfg. & Supply Co.......... ....New York.

CEMENT, IRON FOR REPAIRING LEAKS.
Smooth-On Mfg. Co................ ....Jersey City, N. J.

CHAIN SURVEYORS, HOISTS.
Brown-Hoisting Machinery Co...... ....Cleveland.
General Electric Co............... ....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co...... .... Boston, Mass.

CHARTS.
Penton Publishing Co....Cleveland.

CHECK VALVES.
Scoville Check Valve Co., Ashtabula, O.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.
Ritchie, E. S. & Sons.............. .... Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.
Hanna, M. A. & Co........Cleveland.
Pickands, Mather & Co....Cleveland.
Pittsburg Coal Co........Cleveland

COAL AND ORE HANDLING MACHINERY.
Brown-Hoisting Machinery Co...... ....Cleveland.

COMPASSES.
Ritchie, E. S. & Son.............. .... Brookline, Mass.

CONDENSERS.
Great Lakes Engineering Works.... .... Detroit.
Thropp & Sons Co., John E........ .... Trenton, N. J.
Wheeler Condenser & Engineering Co.................... New York.

CONTRACTORS FOR PUBLIC WORKS.
Breymann Bros., G. H.......Toledo.
Buffalo Dredging Co.........Buffalo.
Dunbar & Sullivan Dredging Co.... ....Buffalo.
Great Lakes Dredge & Dock Co.... .... Chicago.
Hickler Bros...... ....Sault Ste. Marie, Mich.
Hubbell Co., H. W..Saginaw, Mich
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H... .... Milwaukee.
Standard Contracting Co..Cleveland.
Sullivan, M................ Detroit.

CORDAGE.
Baker & Co., H. H..........Buffalo.
Upson-Walton Co.........Cleveland.

Buyers' Directory of the Marine Trade.—*Continued.*

CORK JACKETS AND RINGS.
Armstrong Cork Co..Pittsburg, Pa.
Kahnweiler's Sons, D....New York.

CRANES, TRAVELING.
Brown-Hoisting Machinery Co...... .... Cleveland.

DIVING APPARATUS.
Morse, A. J. & Son........Boston.
Schrader's Son, Inc., A..New York.

DREDGING CONTRACTORS.
Breymann & Bros., G. H....Toledo.
Buffalo Dredging Co........Buffalo.
Dunbar & Sullivan Dredging Co.... .... Buffalo.
Great Lakes Dredge & Dock Co.. .... Chicago.
Hickler Bros. ....Sault Ste. Marie, Mich.
Hubbell Co., H. W..Saginaw, Mich.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H... ....Milwaukee.
Sullivan, M.................Buffalo.

DREDGING MACHINERY.
Quintard Iron Works Co.New York.

DRY DOCKS.
American Ship Building Co........ .... Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co......Buffalo.
Chicago Ship Building Co.......... .... Chicago.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co.......... .... Detroit
Great Lakes Engineering Works.... .... Detroit.
Lockwood Mfg. Co................ ....East Boston, Mass.
Milwaukee Dry Dock Co........... ....Milwaukee.
Newport News Ship Building Co... ....Newport News, Va.
Shipowners' Dry Dock Co.Chicago.
Superior Ship Building Co........ .... Superior, Wis.
Tietjen & Lang Dry Dock Co...... .... Hoboken, N. J.
Toledo Ship Building Co......Toledo.

DREDGE BUILDERS.
Manitowoc Dry Dock Co.......... .... Manitowoc, Wis.

DYNAMOS.
General Electric Co................ ....Schenectady, N. Y.
Thropp & Sons, John E............ ....Trenton, N. J.

ELECTRIC HOISTS AND CRANES.
General Electric Co................ ....Schenectady, N. Y.

ELECTRIC LIGHT AND POWER PLANTS.
General Electric Co................ ....Schenectady, N. Y.
Thropp & Sons, John E............ ....Trenton, N. J.

ENGINE BUILDERS, MARINE.
American Blower Co., Detroit, Mich.
American Ship Building Co......... .... Cleveland.
Atlantic Works, East Boston, Mass.
Briggs, Marvin..........New York.
Chicago Ship Building Co., Chicago.
Chase Machine Co........Cleveland.
Cramp, Wm. & Sons, Philadelphia.
Detroit Ship Building Co., Detroit.
Fletcher, W. & A. Co., Hoboken, N. J.

ENGINE BUILDERS—Continued.
Fore River Shipbuilding Co......... .... Quincy, Mass.
Great Lakes Engineering Works.... .... Detroit, Mich.
Hall Bros. .... Philadelphia.
Lockwood Mfg. Co................ ....East Boston, Mass.
Maryland Steel Co................ ....Sparrows Point, Md.
Milwaukee Dry Dock Co., Milwaukee.
Mosher, Chas. D.........New York.
Newport News Ship Building Co.... ....Newport News, Va.
New York Ship Building Co........ ....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co. .... Duluth, Mich.
Quintard Iron Works Co., New York.
Roach's Ship Yard......Chester, Pa.
Sheriffs Mfg. Co.........Milwaukee.
Superior Ship Building Co.......... .... Superior, Wis.
Thropp, J. E. & Sons Co............ ....Trenton, N. J.
Toledo Ship Building Co......Toledo.
Trout, H. G................Buffalo.

ENGINE ROOM TELEGRAPH CALL BELLS, ETC.
Cory, Chas. & Son......New York.
Marine Mfg. Supply Co., New York.

ENGINEERING SPECIALTIES AND SUPPLIES.
Lunkenheimer Co. ...... Cincinnati.
Northwestern Steam Boiler & Mfg. Co. .... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander .... Cleveland.
Hunt, Robt. W. & Co......Chicago.
Kidd, Joseph..........Duluth, Minn.
Mosher, Chas. D........New York.
Nacey, James .... Cleveland.
Roelker, H. B............New York.
Wood, W. J................Chicago.

FANS.
American Blower Co., Detroit, Mich.

FEED WATER PURIFIERS AND HEATERS.
Ross Valve Co..........Troy, N. Y.
Wheeler Condenser & Engineering Co. .... New York.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co................. ....Schenectady, N. Y.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co.... .... Cleveland.
Fore River Shipbuilding Co......... .... Quincy, Mass.

FLUE WELDING.
Fix's S. Sons............Cleveland.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co......Cleveland.
Parker Bros. Co., Ltd......Detroit.
Pickands, Mather & Co., Cleveland.
Pittsburg Coal Co........Cleveland.
Smith, Stanley B., & Co., Detroit.
Toledo Fuel Company, ...Toledo, O.

FURNACES FOR BOILERS.
Continental Iron Works, New York

GAS BUOYS.
Safety Car Heating & Lighting Co.. .... New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co........Cleveland.

GAUGES, STEAM AND VACUUM.
Lunkenheimer Co. ...... Cincinnati.

GAUGES, WATER.
Lunkenheimer Co......Cincinnati, O.

GENERATING SETS.
General Electric Co................ ....Schenectady, N. Y.

GRAPHITE.
Dixon Crucible Co., Joseph.......... ....Jersey City, N. J.

HAMMERS, STEAM.
Chase Machine Co........Cleveland.

HEATING AND VENTILATING APPARATUS.
American Blower Co., Detroit, Mich.

HOISTS FOR CARGO, ETC.
American Ship Building Co.......... .... Cleveland.
Brown Hoisting Machinery Co...... .... Cleveland.
Chase Machine Co.......Cleveland.
Dake Engine Co.................. ....Grand Haven, Mich.
General Electric Co......New York.
Hyde Windlass Co........Bath, Me.
Marine Iron Co............Bay City.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co.......... ....Cuyahoga Falls, O.

HYDRAULIC DREDGES.
Great Lakes Engineering Works.... .... Detroit.

HYDRAULIC TOOLS.
Watson-Stillman Co., The......... .... New York.

ICE MACHINERY.
Great Lakes Engineering Works.... .... Detroit.
Roelker, H. B............New York.

INJECTORS.
American Injector Co......Detroit.
Jenkins Bros............New York.
Lunkenheimer Co. ...... Cincinnati.
Penberthy Injector Co............. .... Detroit, Mich.

INSURANCE, MARINE.
Atlantic Mutual Insurance Co........ ....New York.
Elphicke, C. W. & Co......Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A., Cleveland.
Helm & Co., D. T..........Duluth.
Hutchinson & Co.........Cleveland.
McCarthy, T. R...........Montreal.
McCurdy, Geo. L...........Chicago.
Mitchell & Co............Cleveland.
Parker Bros. Co., Ltd......Detroit.
Peck, Chas. E. & W. F............ ....New York and Chicago.
Prindiville & Co...........Chicago.
Richardson, W. C........Cleveland.
Sullivan, D. & Co..........Chicago.

G. H.

Wrecking Steamer FAVORITE

Located at St. Ignace this Year.

The Wrecking Steamer FAVORITE, Alex. Cunning, Master, will be stationed during season 1906 at ST. IGNACE, MICH. A Long-Distance Telephone has been installed on board the steamer. When at her home dock, the steamer can be reached by telephone any time day or night, 'Phone Number 63, and in absence of steamer full information as to the steamer may be obtained by telephoning to residence of Capt. Cunning, St. Ignace.

The Favorite and her equipment were thoroughly overhauled during the past winter, and are in first class condition to do outside work.

Smith's Coal Dock

DETROIT RIVER

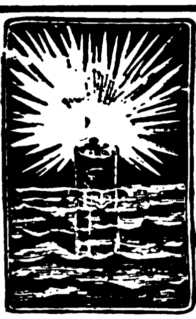
DETROIT, MICH.

12 Pockets. Platform.

Low Dock.

Operated by

STANLEY B. SMITH & CO.



The Water Light

Self-Igniting Inextinguishable

For

Life Saving	Salvage
Distress Signal	Submarine
Repairs and	General
Construction.	Illumination.

Send for Sample. *Agents wanted.*

Patentees and Manufacturers

THE MARINE TORCH CO.

BALTIMORE, MD.

Especially approved by The British Board of Trade, either of Life Buoy Lights or Deck Flare.

Automatic Self-Grinding Check Valves

Have you heard about or seen It?

Descriptive circular sent on request

THE SCOVILLE CHECK VALVE CO.

ASHTABULA, OHIO

New Fast Train to Columbus

THE COLUMBUS FLYER

Via

BIG FOUR ROUTE

Leaves Union Station 6:15 p.m., daily except Sunday, with combination Baggage and Smoking Car, highback coaches and Pullman Buffet Parlor Cars (serving light supper en-route), Stopping at Wellington, New London, Shelby, Crestline, Galion and Delaware and arrives at Columbus 9:35 p. m. Get tickets and Pullman seats at Big 4 Ticket office, No. 532 Euclid Avenue or Union Depot.

THIS IS A VERY FAST TRAIN **Try It**

Iron and Brass Foundry in Connection

Phone, Main 786 Bell 135 W

McLaughlin Iron Works

Engines, Boilers, Mill Machinery and General Repairing

Marine Repair Work a specialty
Let us figure on yours

180 Center Street ASHTABULA, OHIO

Buyers' Directory of the Marine Trade---*Continued.*

IRON ORE AND PIG IRON.

Bourne-Fuller Co......Cleveland, O.
Hanna, M. A. & Co........Cleveland.
Pickands, Mather & Co., Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Truscott Boat Mfg. Co.............. ....St. Joseph, Mich.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co......Pittsburg.
Carley Life Float Co............... ....New York, N. Y.
Drein, Thos. & Son................. .... Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.

Russell & Watson...........Buffalo.

LOGS.

Nicholson Ship Log Co., Cleveland.
Walker & Sons, Thomas............ .... Birmingham, Eng.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph......... ....Jersey City, N. J.

LUBRICATORS.

Lunkenheimer Co. ...... Cincinnati.

LUMBER.

Martin-Barriss Co. ...... Cleveland.

MACHINISTS.

Chase Machine Co.........Cleveland.
Hickler Bros., Sault Ste. Marie, Mich.
Lockwood Mfg. Co................. ....East Boston, Mass.
McLaughlin Iron Works, Ashtabula, O.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc....Philadelphia.

MARINE RAILWAYS.

Hickler Bros., Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.

Crandall & Son, H. I............... ....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W...............New York

MECHANICAL DRAFT FOR BOILERS.

American Blower Co., ...Detroit.
American Ship Building Co......... .... Cleveland.
Detroit Ship Building Co., Detroit.
Great Lakes Engineering Works.... .... Detroit.

METALLIC PACKING.

Katzenstein, L. & Co., New York.
The National Metallic Packing Co.. ....Oberlin, O.

MOTORS, GENERATORS—ELECTRIC.

General Electric Co................ ....Schenectady, N. Y.

NAUTICAL INSTRUMENTS.

Ritchie, E. S., & Sons.............. .... Brookline, Mass.

NAVAL ARCHITECTS.

Hynd, Alexander ....Cleveland
Kidd, Joseph ....Duluth, Minn.
Mosher, Chas. D.........New York.
Nacey, James ....Cleveland
Wood, W. J................Chicago

OAKUM.

Stratford, Oakum Co................ ....Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph........ ....Jersey City, N. J.

PACKING.

Jenkins Bros............New York.
Katzenstein, L. & Co...New York.
Robertson, Jos. L. & Sons.......... ....New York.
The National Metallic Packing Co... .... Oberlin, O.
Republic Belting & Supply Co...... ....Cleveland, O.

PAINTS.

Baker, Howard H. & Co....Buffalo.
Upson-Walton Co........Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc. ..Philadelphia.

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co........Buffalo.
Dunbar & Sullivan Dredging Co.... .... Buffalo.
Great Lakes Dredge & Dock Co.... .... Chicago.
Hickler Bros..Sault Ste. Marie, Mich.
Hubbell Co., H. W...Saginaw, Mich.
Parker Bros. Co., Ltd.......Detroit.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H... ....Milwaukee.
Sullivan, M..................Detroit.

PIPE, WROUGHT IRON.

Bourne-Fuller Co......Cleveland, O.

PLANING MILL MACHINERY.

Atlantic Works, Inc....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co......Cleveland, O.
Otis Steel Co...........Cleveland.

PRESSURE REGULATORS.

Ross Valve Co..........Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co........ .... Cleveland.
Atlantic Works ..East Boston, Mass.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co....Detroit.
Fore River Shipbuilding Co......... .... Quincy, Mass.
Great Lakes Engineering Works.... .... Detroit.
Hyde Windlass Co........Bath, Me.
Lockwood Mfg. Co................ ....East Boston, Mass.
Milwaukee Dry Dock Co.......... ....Milwaukee.
Newport News Ship Building Co.. ....Newport News, Va.
Roelker, H. B..........New York.
Sheriffs Mfg. Co........Milwaukee.
Superior Ship Building Co......... ....Superior, Wis.
Thropp & Sons Co., J. E.......... ....Trenton, N. J.
Toledo Ship Building Co......Toledo.
Trout, H. G................Buffalo.

PROJECTORS, ELECTRIC.

General Electric Co............... ....Schenectady, N. Y.

PUMPS FOR VARIOUS PURPOSES.

Great Lakes Engineering Works.. .... Detroit.

Kingsford 'Foundry **BOILERS.**
Works ....Co. New York
Wheeler Condenser & Engineering Co. ....New York.
.... Detroit.
Roelker, H. B..........New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register......Cleveland.

RIVETS, STEEL FOR SHIPS AND BOILERS.

Bourne-Fuller Co.......Cleveland, O.
Great Lakes Engineering Works....

RUBBER SUPPLIES.

Republic Belting & Supply Co...... .... Cleveland, O.

REFRIGERATING APPARATUS.

SAFETY VALVES.

Lunkenheimer Co.........Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co....Buffalo.
Upson-Walton Co........Cleveland.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

General Electric Co............... ....Schenectady, N. Y.

SHEARS.

See Punches, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co......Cleveland, O.
Otis Steel Co............Cleveland.

SHIP BUILDERS.

American Ship Building Co......... .... Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co.......Buffalo.
Collingwood Shipbuilding Co....... .... Collingwood, Ont.
Cramp, Wm. & Sons..Philadelphia.
Chicago Ship Building Co..Chicago.
Detroit Ship Building Co....Detroit.
Fore River Ship Building Co....... ....Quincy, Mass.
Great Lakes Engineering Works.... ....Detroit.
Lockwood Mfg. Co................ ....East Boston, Mass.
Manitowoc Dry Dock Co........... ....Manitowoc, Wis.
Maryland Steel Co................. ....Sparrow's Point, Md.
Milwaukee Dry Dock Co........... .... Milwaukee.
Newport News Ship Building Co... ....Newport News, Va.
New York Shipbuilding Co......... ....Camden, N. J.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co..Chicago.
Toledo Ship Building Co......Toledo.

SHIP CHANDLERS.

Baker, Howard H. & Co....Buffalo.
Marine Mfg. & Supply Co......... .... New York
Upson-Walton Co........Cleveland.

SHIP DESIGNERS.

Kidd, Joseph ....Duluth.
Steel, Nacey, & Hynd....Cleveland.
Wood, W. J.................Chicago.

Buyers' Directory of the Marine Trade---*Continuea.*

SHIP LANTERNS AND LAMPS.
Upson-Walton Co......... Cleveland.

SHIP TIMBER.
Martin-Barriss Co.........Cleveland.

SIGNALS—SUBMARINE.
Submarine Signal Co............Boston

SMOOTH-ON COMPOUND, FOR REPAIRS.
Smooth-On Mfg. Co.................................Jersey City, N. J.

STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.........................Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.
Holmes, Samuel ....New York.
McCarthy, T. R.....Montreal, Can.

STEAMSHIP LINES, PASS, AND FREIGHT.
American Line ....New York.
Anchor Line ....Buffalo.
Boston Steamship ....Boston.
C. & B. Transit Co...........Cleveland.
International Mercantile Marine Co. .... Philadelphia.
Mallory Line ....New York.
New York & Cuba Mail S. S. Co.. ....New York.
Red Star Line ....New York.

STEAM SPECIALTIES.
Robertson, Jas. L. & Sons ..New York.

STEEL CASTINGS.
Otis Steel Co............Cleveland.

STEERING APPARATUS.
American Ship Building Co.......................Cleveland.
Chase Machine Co.......Cleveland.
Dake Engine Co................................Grand Haven, Mich.
Detroit Ship Building Co....Detroit.
Hyde Windlass Co........Bath, Me.
Marine Mfg. & Supply Co...........................New York.
Sheriffs Mfg. Co........Wilwaukee.

SUBMARINE DIVING APPARATUS.
Morse & Son, A. J..........Boston.
Schrader's Son, Inc. A....New York.

SURVEYORS, MARINE.
Hynd, Alexander ....Cleveland.
Parker Bros. Co., Ltd......Detroit.
Nacey, James ....Cleveland.
Steel, Adam ....Cleveland.
Wood, W. J................Chicago.

TESTS OF MATERIALS.
Hunt, Robert W. & Co....Chicago.
Lunkenheimer Co....Cincinnati, O.

THERMIT
Goldschmidt Thermit Co., ... New York City.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Watson-Stillman Co......New York.

TOOLS, WOOD WORKING.
Atlantic Works, Inc....Philadelphia.

TOWING MACHINES.
American Ship Windlass Co.........................Providence, R. I.
Chase Machine Co.......Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.. ....Kingston, Ont.
Great Lakes Towing Co..Cleveland.

TRUCKS.
Boston & Lockport Block Co...... .... Boston.

TUBING, SEAMLESS.
Shelby Steel Tube Co..Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.
Jenkins Bros. ....New York
Lunkenheimer Co........Cincinnati.
Ross Valve Co.........Troy, N. Y.

VALVES FOR WATER AND GAS.
Ashton Valve Co............Boston.
Lunkenheimer Co........Cincinnati.
Republic Belting & Supply Co...... ....Cleveland, O.
Ross Valve Co........Troy, N. Y.
Scoville Check Valve Co.......... .... Ashtabula, O.

VESSEL AND FREIGHT AGENTS.
Billett, T. R..............,Winnipeg.
Boland, John J.............Buffalo.
Douglas, G. L. Jr............Duluth
Elphicke, C. W. & Co......Chicago.
Hall, John B................Buffalo.
Helm & Co., D. T..........Duluth.
Hawgood & Co., W. A....Cleveland.
Holmes, Samuel ....New York.
Hutchinson & Co.........Cleveland.
McCarthy, T. R..........Montreal.

VESSELS AND FREIGHT AGENTS—Con.
Mitchell & Co............Cleveland.
Parker Bros. Co., Ltd......Detroit.
Prindiville & Co...........Chicago.
Richardson, W. C.........Cleveland.
Sullivan, D. & Co..........Chicago

WATER GAUGES.
Lunkenheimer Co.....Cincinnati, O.

WHISTLES, STEAM.
Lunkenheimer Co........Cincinnati.

WILFORD'S WATERPROOF CLOTH.
Bunker, E. A........... New York.

WIRE ROPE AND WIRE ROPE FITTINGS.
Baker, H. H. & Co..........Buffalo.
Upson-Walton Co.........Cleveland.

WINDLASSES.
American Ship Windlass Co........ .... Providence, R. I.
American Ship Building Co........ .... .Cleveland.
Dake Engine Co.................................Grand Haven, Mich.
Hyde Windlass Co........Bath, Me.
Marine Mfg. & Supply Co........ ....New York.

WINCHES.
American Ship Windlass Co.........................Providence, R. I.
Hyde Windlass Co........Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.. .... Kingston, Ont.
Great Lakes Towing Co..Cleveland.
Parker Bros. Co., Ltd.......Detroit.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son................ .... Wilmington, Del.
Manitowoc Dry Dock Co.......... .... Manitowoc, Wis.
Truscott Boat Mfg. Co...........................St. Joseph, Mich.

YAWLS.
Drein, Thos. & Son............................. .Wilmington, Del.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on page noted.
The dagger (†) indicates that advertisement appears once a month.